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A STRUCTURAL WEIGHT ESTIMATION PROGRAM (SWEEP) FOR AIRCRAFT. VOLUME VI - WING AND EMPENNAGE MODULE. BOOK 3: TECHNICAL DISCUSSION, SECTION V

G. Hayase

Rockwell International Corporation

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Three computer programs were written with the objective of predicting the structural weight of aircraft through analytical methods. The first program, the structural weight estimation program (SWEEP), is a completely integrated program including routines for airloads, loads spectra, skin temperatures, material properties, flutter stiffness requirements, fatigue life, structural sizing, and for weight estimation of each of the major

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20. ABSTRACT (CONTINUED)

aircraft structural components. The program produces first-order weight estimates and indicates trends when parameters are varied. Fighters, bombers, and cargo aircraft can be analyzed by the program. The program operates within 100,000 octal units on the Control Data Corporation 6600 computer. Two stand-alone programs operating within 100,000 octal units were also developed to provide optional data sources for SWEEP. These include (1) the flexible airloads program to assess the effects of flexibility on lifting surface airloads, and (2) the flutter optimization program to optimize the stiffness distribution required for lifting surface flutter prevention.

The final report is composed of 11 volumes. This volume (volume VI) contains the methods and program description for the wing and empennage module of SWEEP. Program listings and flow charts are included in the appendix to this volume.

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BOOK 3

TECHNICAL DISCUSSION, SECTION V

Section V

CORE MAPS FOR OVERLAYS (9,0), (10,0), (14,0), (15,0), (16,0), (17,0), AND (18,0)

Core maps for wing and empennage module overlays other than overlay (8,0) are found in this section. A complete list of all core maps presented in Sections III and V are summarized in Table 155 along with pertinent array specifications and core map table reference numbers. Tables 156 through 237 include core maps for overlays (9,0), (10,0), (14,0), (15,0), (16,0), (17,0), and (18,0).

TABLE 155. CROSS-REFERENCE LIST FOR ARRAY CORE MAPS

Array Name	Overlay	Size	Core Location FORTRAN Ref.	Core Location Blank Common	Table Ref.
ACL	18	900	CT(1)	7121	196
ACLT	18	66	CD(532)	4652	197
ACVMT	18	660	CT(1321)	8441	198
AFD	8	6	T(411)	411	28
CCDLI	15,16,17	150	CD(501)	4621	186
CCI	14	300	CD(1651)	5771	171
CCL	14	300	CD(51)	4171	171
CCT	14	300	CD(351)	4471	171
CCW	14,15,16,17	50	CD(1)	4121	170
CD(1-400)	18	2000	-	4121	217
CFL1I	15,17	150	CD(951)	5071	187
CFL2I	15,17	150	CD(1101)	5221	187
CIØY	14,15,16	150	T(501)	501	175
CIØY	17	150	CD(1401)	5521	175
CKD (LETEI)	14	50	CD(1951)	6071	173
CKD	15	50	CD(1951)	6071	188
CLEI	14,17	150	CD(651)	4771	174
CMII	15,16,17	150	CD(1251)	5371	185
CNT	18	91	T(1541)	1541	202
CTBI	17	150	CD(351)	4471	194
CTBW	9,17,18	150	T(1541)	1541	193
CTEI	14,17	150	CD(801)	4921	174
D	All	2060	-	2061	8
D (array references)	All	2060	-	2061	11
D (variable reference list)	All	2060	-	2061	12
D (input data adjustment)	8	2060	-	2061	42
DAF	8	500	T(1401)	1401	25
DAILK	14	30	D(1765)	3825	164
DC	All	100	D(1401)	3461	10
DC (array references)	All	100	D(1401)	3461	14
DDFS	18	220	CD(661)	4781	221
DDIS	18	220	CD(441)	4561	220
DDLC	18	220	CD(221)	4341	219
DDRS	18	220	CD(881)	5001	221
DDSTR	18	330	CT(1321)	8441	222
DDUC	18	220	CD(1)	4121	219
DFLPK	14	20	D(1745)	3805	163

TABLE 155. CROSS-REFERENCE LIST FOR ARRAY CORE MAPS (CONT)

Array Name	Overlay	Size	Core Location		Table Ref.
			FORTRAN Ref.	Blank Common	
DFSP	14	25	D(1795)	3855	165
DLE	8	23	D(1985)	4045	22
DLE	14	30	D(1205)	4265	156
DLEDK	14	50	D(1530)	3590	159
DLED1	14	30	D(1500)	3560	158
DSPDK	14	15	D(1730)	3790	162
DSPLØ	10,18	7	D(58)	2118	223
DTC	8	22	D(2031)	4091	24
DTE	8	23	D(2008)	4068	23
DTE	14	45	D(1235)	3295	157
DTED1	14	30	D(1580)	3640	160
DTED2	14	120	D(1610)	3670	161
EL	18	15	T(1300)	1300	205
ENQ	18	100	TW(601)	6821	200
ENQC	18	24	TW(787)	7007	201
ENX	18	60	TW(701)	6921	204
FDAT	17	60	/FDATT/	--	5
IEL	18	165	TW(1)	6221	206
IP	All	80	/IPRINT/	--	7
ND	All	100	-	6121	9
ND (array references)	All	100	-	6121	13
PT	9,18	100	T(901)	901	234
S	9,18	200	T(1001)	1001	235
SPAL	8	50	T(1001)	1001	21
SPB	18	33	T(1232)	1232	207
SPN	18	33	T(1265)	1265	208
STRESS	18	1320	CT(1)	7121	203
STRING	18	220	T(1676)	1676	213
T (1 - 200)	All	2060	-	1	34
T (201 - 900)	9,10,17,18	2060	-	1	190
T ((201 - 900) references)	9,10,17,18	2060	-	1	191
TA	18	40	CD(401)	4521	216
TAF	8	350	T(431)	431	29
TCS	14	250	CD(1401)	5521	172
TD	8	600	CD(1101)	5221	40
TDC, metallic analysis	9,10	200	T(1341)	1341	224
TDC, advanced composite analysis	18	200	T(1341)	1341	218

TABLE 155. CROSS-REFERENCE LIST FOR ARRAY CORE MAPS (CONT)

Array Name	Overlay	Size	Core Location FORTRAN Ref.	Core Location Blank Common	Table Ref.
TE	14	150	CD(1251)	5371	183
TEIGJ	18	4	TW(783)	7003	199
TF	18	40	T(2021)	2021	209
TFRDK	8,14	60	T(1986)	1986	37
TG	14,15,16,17	300	T(1001)	1001	166
TGA	14,15,16,17	135	T(1851)	1851	167
TGJ	8,16	200	T(1761)	1761	36
TGR (LETEI)	14	100	T(1751)	1751	181
TGR (LEWT)	14	100	T(1751)	1751	176
TGR (TEWT, TEWTI)	14	100	T(1751)	1751	180
TLED	14	25	TGR(51)	1801	176
TØ	9,10	40	T(920)	920	237
TR (TBWDC)	8	16	T(1301)	1301	50
TS	8	600	CD(1)	4121	41
TSC	9,10,18	420	T(1541)	1541	225
TSEC	9,10,18	300	CD(1501)	5621	226
TSF	18	60	CD(441)	4561	215
TSS (SFSCH, TSCH)	10	100	T(1961)	1961	227
TSS (STRIB)	10	100	T(1961)	1961	228
TSS (STWEB)	10	100	T(1961)	1961	229
TSS (TBØPT, ATBØPT)	9,18	100	T(1961)	1961	236
TST (LETEI)	14	50	T(1701)	1701	182
TST (LEWT)	14	50	T(1701)	1701	177
TST (TEWTI, TEDEV)	14	50	T(1701)	1701	179
TST (WLETE)	14	50	T(1701)	1701	184
TT (GEØMW)	8	20	T(1317)	1317	45
TT (TBWDC, ABØXC)	8	20	T(1317)	1317	51
TTED	14	40	TGR(51)	1801	178
TVF	16	100	T(1961)	1961	192
TVMF	15,16	250	CD(51)	4171	189
TVS	8	400	CD(601)	4721	35
TWG	14,15,16,17	400	T(1301)	1301	169
TWT (1 - 330)	9,10,18	400	CD(1101)	5221	230
TWT (CSECW)	9,18	400	CD(1101)	5221	232
TWT (DLPVT)	9,18	400	CD(1101)	5221	233
TWT (WTP1N)	10,18	400	CD(1101)	5221	231
TX	18	160	CD(1)	4121	211
TXS	18	100	CD(161)	4281	212

TABLE 155. CROSS-REFERENCE LIST FOR ARRAY CORE MAPS (CONCL)

Array Name	Overlay	Size	Core Location FORTRAN Ref.	Core Location Blank Common	Table Ref.
TXY	8,14	500	T(801)	801	30
V	18	660	CD(1321)	8441	198
W(WEIGH1)	18	30	(WEIGH1)	--	210
W(WEIGH2)	18	35	(WEIGH2)	--	214
WCG	17	126	TW(701)	6921	195
WD	8	200	T(1)	1	20
XMISC	All	100	/MISC/	--	6
YC	8	150	T(201)	201	38
YC	14,15,17	150	T(201)	201	168
YLE	8	109	TXY(179)	979	32
YTB	8	124	TXY(55)	855	31
YTC	8,14,15,17	60	T(351)	351	39
YTE	8	109	TXY(288)	1088	33

TABLE 156. DLE ARRAY, VARIABLE DATA SUBARRAY FOR FIXED LEADING EDGE STRUCTURES

General information for array DLE:
- Blank common reference location = D(1205)
- Array size = 30 cells
- Array used by subroutine LEWT for estimation of fixed leading edge weights and mass distributions

Array Location	D Array Ref Location	Default Value	Description
Locations 1-10 contain variable data for wing analysis, D(289) = 0.0.			
1	1205	0.0	$(W/S)_{LE}$, input unit weight to be used in lieu of calculated values, if specified. If 0.0, computed values are used, lb/sq ft.
2	1206	1.0	K_{wt}, weight factor, applied to both calculated and input unit weight.
3	1207	8.0	λwt, chordwise taper ratio of weight distribution surface, z_{FS}/z_{LE}.
4	1208	1.5	K_1, weight equation coefficient
5	1209	0.00077	C_1, weight equation coefficient
6	1210	0.80	C_2, weight equation coefficient
7	1211	0.830	C_3, weight equation coefficient
8	1212	0.10	K_2, equation coefficient for (t/c) effects
9	1213	0.25	C_4, equation coefficient for (t/c) effects
10	1214	0.10	$(t/c)_{ref}$, reference (t/c) for (t/c) effects
Locations 11-20 contain variable data for horizontal tail analysis, D(289) = -1.0.			
11	1215	0.0	$(W/S)_{LE}$, same as DLE(1)
12	1216	1.0	K_{wt}, same as DLE(2)
13	1217	8.0	λwt, same as DLE(3)
14	1218	1.75	K_1, same as DLE(4)
15	1219	0.00040	C_1, same as DLE(5)
16	1220	0.80	C_2, same as DLE(6)
17	1221	0.540	C_3, same as DLE(7)
18	1222	0.10	K_2, same as DLE(8)
19	1223	0.25	C_4, same as DLE(9)
20	1224	0.10	(t/c) ref, same as DLE(10)

TABLE 156. DLE ARRAY, VARIABLE DATA SUBARRAY FOR FIXED LEADING EDGE STRUCTURES (CONCL)

Array Location	D Array Ref Location	Default Value	Description
Locations 21-30 contain variable data for vertical tail analysis, D(289) = +N.			
21	1225	0.0	$(W/S)_{LE}$, same as DLE(1)
22	1226	1.0	K_{wt}, same as DLE(2)
23	1227	8.0	λ_{wt}, same as DLE(3)
24	1228	1.50	K_1, same as DLE(4)
25	1229	0.00040	C_1, same as DLE(5)
26	1230	0.80	C_2, same as DLE(6)
27	1231	0.540	C_3, same as DLE(7)
28	1232	0.10	K_2, same as DLE(8)
29	1233	0.25	C_4, same as DLE(9)
30	1234	0.10	(t/c) ref, same as DLE(10)

TABLE 157. DTE ARRAY, VARIABLE DATA SUBARRAY FOR FIXED TRAILING EDGE STRUCTURES

General information for array DTE:
Blank common reference location = D(1235)
Array size = 45 cells
Array used by subroutine TEWT for estimation of fixed trailing edge weights and mass distribution.

Array Location	D Array Ref Location	Default Value	Description
Location 1-15 contain variable data for wing analysis, D(289) = 0.0.			
1	1235	0.0	$(W/S)_{TE}$, input unit weight to be used in lieu of calculated values, if specified. If 0.0, computed values are used, lb/sq ft.
2	1236	1.0	K_{wt}, weight factor, applied to both calculated and input unit weight.
3	1237	0.01	λ_{wt}, chordwise taper ratio of weight distribution surface, z_{TE}/z_{RS}.
4	1238	1.0	K_1, weight equation coefficient
5	1239	0.35	C_1, weight equation coefficient
6	1240	0.0165	C_2, weight equation coefficient
7	1241	1.45	C_3, weight equation coefficient
8	1242	1.00	C_4, Q correction factor equation coefficient
9	1243	0.70	C_5, Q correction factor equation coefficient
10	1244	950.0	C_6, Q_o, reference Q for correction factor equation, psf
11	1245	1.0	C_7, Q correction factor equation coefficient
12	1246	0.0	Not used
13	1247	0.10	K_2, equation coefficient for (t/c) effects
14	1248	0.25	C_8, equation coefficient for (t/c) effects
15	1249	0.10	$(t/c)_{ref}$, reference (t/c) for (t/c) effects
Locations 16-30 contain variable data for horizontal tail analysis, D(289) = -1.0.			
16	1250	0.0	$(W/S)_{TE}$, same as DTE(1)
17	1251	1.0	K_{wt}, same as DTE(2)
18	1252	0.01	λ_{wt}, same as DTE(3)
19	1253	1.0	K_1, same as DTE(4)

TABLE 157. DTE ARRAY, VARIABLE DATA SUBARRAY FOR FIXED TRAILING EDGE STRUCTURES (CONCL)

Array Location	D Array Ref Location	Default Value	Description
20	1254	0.35	C_1, same as DTE(5)
21	1255	0.0145	C_2, same as DTE(6)
22	1256	1.35	C_3, same as DTE(7)
23	1257	0.75	C_4, same as DTE(8)
24	1258	0.70	C_5, same as DTE(9)
25	1259	950.0	C_6, same as DTE(10)
26	1260	1.0	C_7, same as DTE(11)
27	1261	0.0	Not used
28	1262	0.10	K_2, same as DTE(13)
29	1263	0.25	C_8, same as DTE(14)
30	1264	0.10	$(t/c)_{ref}$, same as DTE(15)
31	1265	0.0	$(W/S)_{TE}$, same as DTE(1)
32	1266	1.0	K_{wt}, same as DTE(2)
33	1267	0.01	λ_{wt}, same as DTE(3)
34	1268	1.0	K_1, same as DTE(4)
35	1269	0.35	C_1, same as DTE(5)
36	1270	0.0145	C_2, same as DTE(6)
37	1271	1.35	C_3, same as DTE(7)
38	1272	0.75	C_4, same as DTE(8)
39	1273	0.70	C_5, same as DTE(9)
40	1274	950.0	C_6, same as DTE(10)
41	1275	1.0	C_7, same as DTE(11)
42	1276	0.0	Not used
43	1277	0.10	K_2, same as DTE(13)
44	1278	0.25	C_8, same as DTE(14)
45	1279	0.10	$(t/c)_{ref}$, same as DTE(15)

TABLE 158. DLED1 ARRAY, VARIABLE DATA SUBARRAY FOR LEADING EDGE CONTROL SURFACES

General information for array DLED1:
Blank common reference location = D(1500)
Array size = 30 cells
Array used by subroutine LEWT for estimation of leading edge control surface weights and mass distributions. Array contains three 10-cell data sets, each to be used to describe separate leading edge devices.

Array Location	D Array Ref Location	Default Value	Description
Locations 1-10 contain variable data for leading edge device 1.			
1	1500	0.0	ID_1, type-of-device code for leading edge device 1. 0.0 = No device, locations 2-9 not processed 1.0 = Slat 2.0 = Kruger flap 3.0 = Droop nose
2	1501	0.0	Number of panel segments, 1, 2, or 3.
3	1502	0.0	Y_{IB}, spanwise location for inboard edge of device (program assumes device edges to be parallel to vehicle centerline). Input value options: 0.XX = fraction of semispan X.XX = buttock plane, in.
4	1503	0.0	$Y_{ØB}$, spanwise location for outboard edge of device. Same as Y1B.
5	1504	0.0	$C_{TE\ IB}$, chordwise location of device trailing edge at inboard station. Input value options: 0.XX = fraction of local trapezoidal chord, forward (-) or aft (+) of local trapezoidal leading edge. X.XX = distance forward (-) or aft (+) of local trapezoidal leading edge, in.

TABLE 158. DLED1 ARRAY, VARIABLE DATA SUBARRAY FOR LEADING EDGE CONTROL SURFACES (CONT)

Array Location	D Array Ref Location	Default Value	Description
6	1505	0.0	$C_{TE\ \emptyset B}$, chordwise location of device trailing edge at the outboard station. Same as $C_{TE\ IB}$.
7	1506	0.0	$\Delta C_{fixed\ IB}$, chordwise location of fixed structure leading edge at inboard station. This point and outboard point, $\Delta C_{fixed\ \emptyset B}$, defines aft control line for determination of fixed structures to be deleted; all fixed structures forward of this line between Y_{IB} and $Y_{\emptyset B}$ are deleted. Input value options: 0.XX = fraction of local trapezoidal chord, forward (-) or aft (+) of local trapezoidal leading edge. X.XX = distance forward (-) or aft (+) of local trapedoidal leading edge, in. NOTE: In slats, specify location of understructure leading edge. For Kruger flaps, specify 0.0. For droop nose, specify hinge point location.
8	1507	0.0	$\Delta C_{fixed\ \emptyset B}$, chordwise location of fixed structure leading edge at outboard station. Same as $\Delta C_{fixed\ IB}$.
9	1508	0.0	$(W/S)_1$, input unit weight for device to be used in lieu of calculated values. Input options: 0.0 = use program calculated values X.XX = use input values (all data in locations 1-8 and 10 are required), lb/sq ft
10	1509	0.0	K_{wt}, weight factor for estimated weight of device, applied to both calculated and input unit weight.

TABLE 158. DLED1 ARRAY, VARIABLE DATA SUBARRAY FOR LEADING EDGE CONTROL SURFACES (CONCL)

Array Location	D Array Ref Location	Default Value	Description
Locations 11-20 contain variable data for leading edge device 2.			
11	1510	0.0	ID_2, same as DLED1(1). Same device type may be specified.
12	1511	0.0	Number of panels, device 2
13	1512	0.0	Y_{IB}, same as DLED1(3)
14	1513	0.0	$Y_{ØB}$, same as DLED1(4)
15	1514	0.0	C_{TE} IB, same as DLED1(5)
16	1515	0.0	C_{TE} ØB, same as DLED1(6)
17	1516	0.0	ΔC_{fixed} IB, same as DLED1(7)
18	1517	0.0	ΔC_{fixed} ØB, same as DLED1(8)
19	1518	0.0	$(W/S)_2$, same as DLED1(9)
20	1519	0.0	K_{wt}, same as DLED1(10)
Locations 21-30 contain variable data for leading edge device 3.			
21	1520	0.0	ID_3, same as DLED1(1)
22	1521	0.0	Number of panels, device 3
23	1522	0.0	Y_{IB}, same as DLED1(3)
24	1523	0.0	$Y_{ØB}$, same as DLED1(4)
25	1524	0.0	C_{TE} IB, same as DLED1(5)
26	1525	0.0	C_{TE} ØB same as DLED1(6)
27	1526	0.0	ΔC_{fixed} IB, same as DLED1(7)
28	1527	0.0	ΔC_{fixed} ØB, same as DLED1(8)
29	1528	0.0	$(W/S)_3$, same as DLED1(9)
30	1529	0.0	K_{wt}, same as DLED1(10)

TABLE 159. DLEDK ARRAY, VARIABLE DATA SUBARRAY, LEADING EDGE CONTROL SURFACE ANALYSIS CONSTANTS

General information for array DLEDK:
Blank common reference location = D(1530)
Array size = 50 cells
Array contains equation and design constants for estimation of leading edge control surface weights and mass distributions.

Array Location	D Array Ref Location	Default Value	Description
Locations 1-15 contain data for analysis of leading edge slats.			
1	1530	1.0	$K_{\Delta LE}$, weight factor to be applied to calculated fixed leading edge weights that are deleted (replaced by slat structure weights).
2	1531	0.145	$\lambda_{slat\ wt}$, chordwise taper ratio of slat weight distribution surface, z_{TE}/z_{LE}.
3	1532	1.0	K_1, slat weight equation coefficient
4	1533	0.551	C_1, slat weight equation coefficient
5	1534	0.32	C_2, slat weight equation coefficient
6	1535	1.0	C_3, slat weight equation coefficient
7	1536	0.80	C_4, slat weight equation coefficient
8	1537	0.25	C_5, slat weight equation coefficient
9	1538	0.10	K_2, equation coefficient for (t/c) effects
10	1539	0.25	C_6, equation coefficient for (t/c) effects
11	1540	0.10	$(t/c)_{ref}$, reference (t/c) for (t/c) effects
12	1541	0.01	K_3, weight factor for volume effects
13	1542	1.0	K_4, weight coefficient for actuator effects
14	1543	0.125	C_9, equation coefficient for actuator effects
15	1544	1.0	N_{act}, number of actuators per panel.
Locations 16-30 contain data for analysis of leading edge Kruger flaps.			
16	1545	1.0	$K_{\Delta LE}$, same as DLEDK(1)
17	1546	1.50	$\lambda_{Kruger\ wt}$, same as DLEDK(2)
18	1547	1.0	K_1, same as DLEDK(3)
19	1548	0.413	C_1, same as DLEDK(4)
20	1549	0.32	C_2, same as DLEDK(5)
21	1550	0.667	C_3, same as DLEDK(6)
22	1551	0.80	C_4, same as DLEDK(7)

TABLE 159. DLEDK ARRAY, VARIABLE DATA SUBARRAY, LEADING EDGE CONTROL SURFACE ANALYSIS CONSTANTS (CONCL)

Array Location	D Array Ref Location	Default Value	Description
23	1552	0.25	C_5, same as DLEDK(8)
24	1553	0.10	K_2, same as DLEDK(9)
25	1554	0.25	C_6, same as DLEDK(10)
26	1555	0.10	$(t/c)_{ref}$, same as DLEDK(11)
27	1556	0.01	K_3, same as DLEDK(12)
28	1557	0.75	K_4, same as DLEDK(13)
29	1558	0.125	C_7, same as DLEDK(14)
30	1559	1.0	N_{act}, same as DLEDK(15)
Locations 31-46 contain data for analysis of leading edge droop nose device. Locations 47-50 are not used.			
31	1560	1.0	$K_{\Delta LE}$, same as DLEDK(1)
32	1561	9.0	$\lambda_{droop\ nose\ wt}$, same as DLEDK(2)
33	1562	1.725	K_1, same as DLEDK(3)
34	1563	0.00077	C_1, same as DLEDK(4)
35	1564	0.80	C_2, same as DLEDK(5)
36	1565	0.330	C_3, same as DLEDK(6)
37	1566	0.80	C_4, same as DLEDK(7)
38	1567	0.25	C_5, same as DLEDK(8)
39	1568	0.10	K_2, same as DLEDK(9)
40	1569	0.25	C_6, same as DLEDK(10)
41	1570	0.10	$(t/c)_{ref}$, same as DLEDK(11)
42	1571	0.01	K_3, same as DLEDK(12)
43	1572	0.50	K_4, same as DLEDK(13)
44	1573	0.125	C_7, same as DLEDK(14)
45	1574	1.0	N_{act}, same as DLEDK(15)
46	1575	0.830	C_8, droop nose weight equation coefficient.
47	1576	0.0	Not used
48	1577	0.0	Not used
49	1578	0.0	Not used
50	1579	0.0	Not used

TABLE 160. DTED1 ARRAY, VARIABLE DATA SUBARRAY FOR TRAILING EDGE CONTROL SURFACES, SPOILERS

General information for array DTED1:
Blank common reference location = D(1580)
Array size = 30 cells
Array used by subroutines TEDEV and TEWTI for estimation of trailing edge spoiler weights and mass distributions. Array contains two 15-cell data sets, each to be used to describe separate spoiler devices.

Location Array Location	Location Ref Location	Default Value	Description
Locations 1-15 contain data for analysis of spoiler device 1.			
1	1580	0.0	Number of panel segments, 1, 2, or 3. Value in this location used to determine if spoiler device is being specified. A value of 0.0 is interpreted as no spoiler, locations 2-15 not processed.
2	1581	0.0	Y_{IB}, spanwise location for inboard edge of device (program assumes device edges to be parallel to the vehicle centerline. Spoiler device may be located at the same spanwise positions as trailing edge flaps). Input value options: 0.XX = fraction of semi-span X.XX = buttock plane, in.
3	1582	0.0	$Y_{\emptyset B}$, spanwise location for outboard edge of device. Same as Y_{IB}.
4	1583	0.0	$C_{FWD\ IB}$, chordwise location of spoiler leading edge (hinge line) at inboard station. Input value options: ≤ 2.0 = fraction of local trapezoidal chord aft of local trapezoidal leading edge >2.0 = distance aft of local trapezoidal leading edge, in
5	1584	0.0	$C_{FWD\ \emptyset B}$, chordwise location of spoiler leading edge at outboard station. Same as $C_{FWD\ IB}$.

TABLE 160. DTED1 ARRAY, VARIABLE DATA SUBARRAY FOR TRAILING EDGE CONTROL SURFACES, SPOILERS (CONT)

Array Location	D Array Ref Location	Default Value	Description
6	1585	0.0	$C_{AFT\ IB}$, chordwise location of spoiler trailing edge at the inboard station. Same as $C_{FWD\ IB}$.
7	1586	0.0	$C_{AFT\ ØB}$, chordwise location of spoiler trailing edge at the outboard station. Same as $C_{FWD\ IB}$.
8	1587	0.0	$(W/S)_1$, input unit weight for device to be used in lieu of calculated values. Input options: 0.0 = use program calculated values X.XX = use input values (all data in locations 1-7, 9 and 10 are required), lb/sq ft
9	1588	0.0	K_{wt}, weight factor for estimated weight of device, applied to both calculated and input unit weight.
10	1589	0.0	$ID_{\Delta TE}$ spoilers, control indicator for processing of fixed trailing edge structure replaced with spoiler structure: 0.0 = No processing of fixed trailing edge structure. Program assumes spoiler positioned over flaps; deletion of fixed trailing edge structure based on flap analysis 1.0 = Process data for deletion of fixed trailing edge structure
11	1590	0.0	Not used
12	1591	0.0	Not used
13	1592	0.0	Not used
14	1593	0.0	Not used
15	1594	0.0	Not used
Locations 16-30 contain data for analysis of spoiler device 2.			
16	1595	0.0	Number of panel segments, same as DTED1(1)
17	1596	0.0	Y_{IB}, same as DTED1(2)
18	1597	0.0	$Y_{ØB}$, same as DTED1(3)
19	1598	0.0	$C_{FWD\ IB}$, same as DTED1(4)

TABLE 160. DTED1 ARRAY, VARIABLE DATA SUBARRAY FOR TRAILING EDGE CONTROL SURFACES, SPOILERS (CONCL)

Array Location	D Array Ref Location	Default Value	Description
20	1599	0.0	$C_{FWD\ \emptyset B}$, same as DTED1(5)
21	1600	0.0	$C_{AFT\ IB}$, same as DTED1(6)
22	1601	0.0	$C_{AFT\ \emptyset B}$, same as DTED1(7)
23	1602	0.0	$(W/S)_2$, same as DTED1(8)
24	1603	0.0	K_{wt}, same as DTED1(9)
25	1604	0.0	$ID_{\Delta TE}$ spoilers, same as DTED1(10)
26	1605	0.0	Not used
27	1606	0.0	Not used
28	1607	0.0	Not used
29	1608	0.0	Not used
30	1609	0.0	Not used

TABLE 161. DTED2 ARRAY, VARIABLE DATA SUBARRAY FOR TRAILING EDGE FLAP-TYPE CONTROL SURFACES

General information for array DTED2:

Blank common reference location = D(1610)

Array size = 120 cells

Array used by subroutines TEDEV and TEWTI for estimation of trailing edge flap-type control surface weight and mass distribution. Array contains six 20-cell data sets to be used to describe up to four separate flap-type devices for wing and empennage. The first four sets are for wing design: sets 1-3 for flaps, and set 4 for flaps or ailerons. Set 5 is used for horizontal tail elevators; set 6 is used for vertical tail rudders. The first three sets are always processed for wing and empennage analysis. Sets 4, 5, and 6 are processed only in accordance to the surface type.

Array Location	D Array Ref Location	Default Value	Description
Locations 1-20 contain data for analysis of trailing edge flap device 1:			
1	1610	0.0	ID_1, type of flap code: 0.0 = plain flap 1.0 = single-slotted flaps 2.0 = double-slotted flaps 3.0 = triple-slotted flaps NOTE: Data requirements in locations 5-14 based on code value. Required data are: Code value 0.0 and 1.0, locations 5 and 6 Code value 2.0, locations 5-10 Code value 3.0, locations 5-14
2	1611	0.0	Number of panel segments, 1, 2, or 3. Value in this location is used to determine if flap device is to be processed. A value of 0.0 is interpreted as no flap; data in locations 1 and 3-20 are not processed.

TABLE 161. DTED2 ARRAY, VARIABLE DATA SUBARRAY FOR TRAILING EDGE FLAP-TYPE CONTROL SURFACES (CONT)

Array Location	D Array Ref Location	Default Value	Description
3	1612	0.0	Y_{IB}, spanwise location for inboard edge of device. (Program assumes device edge to be parallel to vehicle centerline. Flap device may be located at the same spanwise position as spoiler devices.) Input value options: 0.XX = fraction of semi-span; X.XX = buttock plane, in.
4	1613	0.0	$Y_{\emptyset B}$, spanwise location for outboard edge of device. Same as Y_{IB}.
NOTE: Locations 5-18 contain chordwise location data. Input options for these locations are: ≤ 2.0 = fraction of local trapezoidal chord aft of local trapezoidal leading edge. >2.0 = distance aft of local trapezoidal leading edge, in.			
5	1614	0.0	$C_{1\ IB}$, leading edge location of forward flap panel at inboard station.
6	1615	0.0	$C_{1\ \emptyset B}$, leading edge location of forward flap panel at outboard station.
7	1616	0.0	$C_{2\ IB}$, trailing edge location of forward flap panel at inboard station, required only for double- and triple-slotted flaps, flap ID = 2 or 3.
8	1617	0.0	$C_{2\ \emptyset B}$, trailing edge location of forward flap panel at outboard station.
9	1618	0.0	$C_{3\ IB}$, leading edge location at inboard station for second flap panel; aft-panel for double-slotted flaps, mid-panel for triple-slotted flaps.
10	1619	0.0	$C_{3\ \emptyset B}$, leading edge location at outboard station for second flap panel.
11	1620	0.0	$C_{4\ IB}$, trailing edge location at inboard station of midpanel for triple-slotted flaps. Not required for double-slotted flaps.

TABLE 161. DTED2 ARRAY, VARIABLE DATA SUBARRAY FOR TRAILING EDGE FLAP-TYPE CONTROL SURFACES (CONT)

Array Location	D Array Ref Location	Default Value	Description
12	1621	0.0	$C_{4\ \emptyset B}$, trailing edge location at outboard station of midpanel for triple-slotted flaps.
13	1622	0.0	$C_{5\ IB}$, leading edge location at inboard station of aft panel for triple-slotted flaps.
14	1623	0.0	$C_{5\ \emptyset B}$, leading edge location at outboard station of aft panel for triple-slotted flaps.
15	1624	0.0	$C_{TE\ UPR\ IB}$, fixed trailing edge upper surface cutoff location (trailing edge of upper shroud) at inboard station.
16	1625	0.0	$C_{TE\ UPR\ \emptyset B}$, fixed trailing edge upper surface cutoff location at outboard station.
17	1626	0.0	$C_{TE\ LWR\ IB}$, fixed trailing edge lower surface cutoff location (trailing edge of lower shroud) at inboard station.
18	1627	0.0	$C_{TE\ LWR\ \emptyset B}$, fixed trailing edge lower surface cutoff location at outboard station.
19	1628	0.0	$(W/S)_1$, input unit weight for flaps to be used in lieu of calculated values. Unit weight value based on sum of projected area for all panels. Input options: 0.0 = use program calculated values. X.XX = use input values (all data in locations 1-18 and 20 are required), lb/sq ft
20	1629	0.0	K_{wt}, weight factor for estimated weight of device, applied to both calculated and input unit weight.
Locations 21-40 contain data for analysis of trailing edge flap device 2.			
21	1630	0.0	ID_2, same as DTED2(1)
22	1631	0.0	Number of panel segments, control code for processing of flap 2 data.

TABLE 161. DTED2 ARRAY, VARIABLE DATA SUBARRAY FOR TRAILING EDGE FLAP-TYPE CONTROL SURFACES (CONT)

Array Location	D Array Ref Location	Default Value	Description
23	1632	0.0	Y_{IB}, same as DTED2(3)
24	1633	0.0	$Y_{\emptyset B}$, same as DTED2(4)
25	1634	0.0	$C_{1\ IB}$, same as DTED2(5)
26	1635	0.0	$C_{1\ \emptyset B}$, same as DTED2(6)
27	1636	0.0	$C_{2\ IB}$, same as DTED2(7)
28	1637	0.0	$C_{2\ \emptyset B}$, same as DTED2(8)
29	1638	0.0	$C_{3\ IB}$, same as DTED2(9)
30	1639	0.0	$C_{3\ \emptyset B}$, same as DTED2(10)
31	1640	0.0	$C_{4\ IB}$, same as DTED2(11)
32	1641	0.0	$C_{4\ \emptyset B}$, same as DTED2(12)
33	1642	0.0	$C_{5\ IB}$, same as DTED2(13)
34	1643	0.0	$C_{5\ \emptyset B}$, same as DTED2(14)
35	1644	0.0	$C_{TE\ UPR\ IB}$, same as DTED2(15)
36	1645	0.0	$C_{TE\ UPR\ \emptyset B}$, same as DTED2(16)
37	1646	0.0	$C_{TE\ LWR\ IB}$, same as DTED2(17)
38	1647	0.0	$C_{TE\ LWR\ \emptyset B}$, same as DTED2(18)
39	1648	0.0	$(W/S)_2$, same as DTED2(19)
40	1649	0.0	K_{wt}, same as DTED2(20)
Locations 41-60 contain data for analysis of trailing edge flap device 3.			
41	1650	0.0	ID_3, same as DTED2(1)
42	1651	0.0	Number of panel segments, control code for processing of flap 3 data
43	1652	0.0	Y_{IB}, same as DTED2(3)
44	1653	0.0	$Y_{\emptyset B}$, same as DTED2(4)
45	1654	0.0	$C_{1\ IB}$, same as DTED2(5)
46	1655	0.0	$C_{1\ \emptyset B}$, same as DTED2(6)
47	1656	0.0	$C_{2\ IB}$, same as DTED2(7)
48	1657	0.0	$C_{2\ \emptyset B}$, same as DTED2(8)
49	1658	0.0	$C_{3\ IB}$, same as DTED2(9)
50	1659	0.0	$C_{3\ \emptyset B}$, same as DTED2(10)
51	1660	0.0	$C_{4\ IB}$, same as DTED2(11)
52	1661	0.0	$C_{4\ \emptyset B}$, same as DTED2(12)
53	1662	0.0	$C_{5\ IB}$, same as DTED2(13)
54	1663	0.0	$C_{5\ \emptyset B}$, same as DTED2(14)
55	1664	0.0	$C_{TE\ UPR\ IB}$, same as DTED2(15)

TABLE 161. DTED2 ARRAY, VARIABLE DATA SUBARRAY FOR TRAILING EDGE FLAP-TYPE CONTROL SURFACES (CONT)

Array Location	D Array Ref Location	Default Value	Description
56	1665	0.0	C_{TE} UPR ØB, same as DTED2(16)
57	1666	0.0	C_{TE} LWR IB, same as DTED2(17)
58	1667	0.0	C_{TE} LWR ØB, same as DTED2(18)
59	1668	0.0	$(W/S)_3$, same as DTED2(19)
60	1669	0.0	K_{wt}, same as DTED2(20)
Locations 61-80 contain data for analysis of (1) trailing edge flap device 4, or (2) wing ailerons. This data set not processed for empennage surfaces.			
61	1670	0.0	ID_4, type code for wing flap-type device 4. If flaps, use same code as DTED2(1). If ailerons, specify code value of 4.0. NOTE: Treat aileron as simple flaps for geometry inputs.
62	1671	0.0	Number of panel segments, control code for processing of device 4 data
63	1672	0.0	Y_{IB}, same as DTED2(3)
64	1673	0.0	$Y_{ØB}$, same as DTED2(4)
65	1674	0.0	C_1 IB, same as DTED2(5)
66	1675	0.0	C_1 ØB, same as DTED2(6)
67	1676	0.0	C_2 IB, same as DTED2(7)
68	1677	0.0	C_2 ØB, same as DTED2(8)
69	1678	0.0	C_3 2B, same as DTED2(9)
70	1679	0.0	C_3 ØB, same as DTED2(10)
71	1680	0.0	C_4 IB, same as DTED2(11)
72	1681	0.0	C_4 ØB, same as DTED2(12)
73	1682	0.0	C_5 IB, same as DTED2(13)
74	1683	0.0	C_5 ØB, same as DTED2(14)
75	1684	0.0	C_{TE} UPR IB, same as DTED2(15)
76	1685	0.0	C_{TE} UPR ØB, same as DTED2(16)
77	1686	0.0	C_{TE} LWR IB, same as DTED2(17)
78	1687	0.0	C_{TE} LWR ØB, same as DTED2(18)
79	1688	0.0	$(W/S)_4$, same as DTED2(19)
80	1689	0.0	K_{wt}, same as DTED2(20)

TABLE 161. DTED2 ARRAY, VARIABLE DATA SUBARRAY FOR TRAILING EDGE FLAP-TYPE CONTROL SURFACES (CONT)

Array Location	D Array Ref Location	Default Value	Description
Locations 81-100 contain data for analysis of horizontal tail elevators. This data set is processed in lieu of data in locations 61-80 for horizontal tails only.			
81	1690	0.0	ID_5, type code for device. Specify 5.0 for elevator analysis. NOTE: Treat elevator as simple flaps for geometry inputs.
82	1691	0.0	Number of panel segments, control code for processing of device data
83	1692	0.0	Y_{IB}, same as DTED2(3)
84	1693	0.0	$Y_{\emptyset B}$, same as DTED2(4)
85	1694	0.0	$C_{1\ IB}$, same as DTED2(5)
86	1695	0.0	$C_{1\ \emptyset B}$, same as DTED2(6)
87	1696	0.0	Not required
88	1697	0.0	Not required
89	1698	0.0	Not required
90	1699	0.0	Not required
91	1700	0.0	Not required
92	1701	0.0	Not required
93	1702	0.0	Not required
94	1703	0.0	Not required
95	1704	0.0	$C_{TE\ UPR\ IB}$, same as DTED2(15)
96	1705	0.0	$C_{TE\ UPR\ \emptyset B}$, same as DTED2(16)
97	1706	0.0	$C_{TE\ LWR\ IB}$, same as DTED2(17)
98	1707	0.0	$C_{TE\ LWR\ \emptyset B}$, same as DTED2(18)
99	1708	0.0	$(W/S)_5$, same as DTED2(19)
100	1709	0.0	K_{wt}, same as DTED2(20)
Locations 101-120 contain data for analysis of vertical tail rudders. This data set is processed in lieu of data in locations 61-80 for vertical tails only.			
101	1710	0.0	ID_6, type code for device. Specify 6.0 for rudder analysis. NOTE: Treat rudder as simple flaps for geometry inputs.
102	1711	0.0	Number of panel segments, control code for processing of device data.

TABLE 161. DTED2 ARRAY, VARIABLE DATA SUBARRAY FOR TRAILING EDGE FLAP-TYPE CONTROL SURFACES (CONCL)

Array Location	D Array Ref Location	Default Value	Description
103	1712	0.0	Y_{IB}, same as DTED2(3)
104	1713	0.0	$Y_{ØB}$, same as DTED2(4)
105	1714	0.0	C_1 IB, same as DTED2(5)
106	1715	0.0	C_1 ØB, same as DTED2(6)
107	1716	0.0	Not required
108	1717	0.0	Not required
109	1718	0.0	Not required
110	1719	0.0	Not required
111	1720	0.0	Not required
112	1721	0.0	Not required
113	1722	0.0	Not required
114	1723	0.0	Not required
115	1724	0.0	C_{TE} UPR IB, same as DTED2(15)
116	1725	0.0	C_{TE} UPR ØB, same as DTED2(16)
117	1726	0.0	C_{TE} LWR IB, same as DTED2(17)
118	1727	0.0	C_{TE} LWR ØB, same as DTED2(18)
119	1728	0.0	$(W/S)_6$, same as DTED2(19)
120	1729	0.0	K_{wt}, same as DTED2(20)

TABLE 162. DSPDK ARRAY, VARIABLE DATA SUBARRAY, SPOILER CONTROL SURFACE ANALYSIS

General information for array DSPDK:
Blank common reference location = D(1730)
Array size = 15 cells
Array contains equation and design constants for estimation of spoiler control surface weights and mass distributions.

Array Location	D Array Ref Location	Default Value	Description
1	1730	0.0	λ_{wt}, chordwise taper ratio of spoiler weight distribution surface z_{TE}/z_{LE}
2	1731	1.0	K_1, spoiler weight equation coefficient
3	1732	0.008	C_1, spoiler weight equation coefficient
4	1733	0.80	C_2, spoiler weight equation coefficient
5	1734	1.95	C_3, spoiler weight equation coefficient
6	1735	0.10	K_2, equation coefficient for (t/c) effects
7	1736	0.25	C_4, equation coefficient for (t/c) effects
8	1737	0.10	$(t/c)_{ref}$, reference (t/c) for (t/c) effects
9	1738	0.01	K_3, weight factor for volume effects
10	1739	1.0	K_4, weight coefficients for actuator effects
11	1740	0.125	C_5, equation coefficient for actuator effects
12	1741	1.0	N_{act}, number of actuators per panel
13	1742	0.45	$K_{(-\Delta TE)}$, weight factor to be used for computation of fixed trailing edge weight to be deleted and replaced with spoiler structure, used only if DTED1(10), D(1589) or DTED1(25), D(1604) is a nonzero value (no trailing edge flaps positioned under the spoilers). Factor applied to ordinate of fixed structure unit weight at the spoiler leading edge for approximation of deleted structure. Delta weight ordinate at spoiler trailing edge is assumed to be 0.0.
14	1743	0.15	$K_{(+\Delta TE)}$, weight factor to be applied to fixed trailing edge structure between rear spar and spoiler leading edge to account for weight increment to fixed trailing edge structure for spoiler installation, used only if DTED1(10) or DTED1(25) is a nonzero value
15	1744	0.0	Not used

TABLE 163. DFLPK ARRAY, VARIABLE DATA SUBARRAY, TRAILING EDGE FLAP CONTROL SURFACE ANALYSIS

General information for array DFLPK:

Blank common reference location = D(1745)

Array size = 20 cells

Array contains equation and design constants for estimation of trailing edge flap control surf e weights and mass distribution.

Array Location	D Array Ref Location	Default Value	Description
1	1745	0.001	λ_{wt}, chordwise taper ratio of flap weight distribution surface, panels in retracted position.
2	1746	0.69	C_1, flap weight equation coefficient
3	1747	14.4	C_2, flap weight equation coefficient
4	1748	0.25	C_3, flap weight equation coefficient
5	1749	0.0	C_4, flap weight equation coefficient
6	1750	1.0	K_1, flap weight equation coefficient, type 0, simple flap
7	1751	1.25	K_1, flap weight equation coefficient, type 1, single-slotted flap
8	1752	1.50	K_1, flap weight equation coefficient, type 2, double-slotted flap
9	1753	1.75	K_1, flap weight equation coefficient, type 3, triple-slotted flap
10	1754	0.10	K_2, equation coefficient for (t/c) effects
11	1755	0.25	C_5, equation coefficient for (t/c) effects
12	1756	0.10	$(t/c)_{ref}$, reference (t/c) for (t/c) effects
13	1757	0.01	K_3, weight coefficient for volume effects
14	1758	0.25	K_4, equation coefficient for actuator effects
15	1759	0.125	C_6, equation coefficient for actuator effects
16	1760	1.0	N_{act}, number of actuators per panel
17	1761	0.25	$K_{\Delta TE\ UPR}$, weight factor to be applied to fixed trailing edge structure between rear spar and flap leading edge to account for weight increment to upper surface of fixed trailing edge structure for flap installation
18	1761	0.125	$K_{\Delta TE\ LWR}$, weight factor, same as the foregoing, but for lower surface increment
19	1763	0.0	Not used
20	1764	0.0	Not used

TABLE 164. DAILK ARRAY, VARIABLE DATA SUBARRAY, AILERON, ELEVATOR AND RUDDER CONTROL SURFACE ANALYSIS

General information for array DAILK:

Blank common reference location = D(1765)

Array size = 30 cells

Array contains equation and design constants for estimation of aileron, elevator and rudder control surface weights and mass distributions.

Array Location	D Array Ref Location	Default Value	Description
Locations 1-20 contain data for analysis of ailerons. Locations 8-18 are also used for elevator and rudder analysis.			
1	1765	0.0	λ_{wt}, chordwise taper ratio of aileron weight distribution surface, z_{TE}/z_{LE}.
2	1766	1.0	K_1, aileron weight equation coefficient
3	1767	0.01825	C_1, aileron weight equation coefficient
4	1768	0.35	C_2, aileron weight equation coefficient
5	1769	1.55	C_3, aileron weight equation coefficient
6	1770	0.50	C_4, aileron weight equation coefficient
7	1771	0.25	C_5, aileron weight equation coefficient
8	1772	0.10	K_2, equation coefficient for (t/c) effects
9	1773	0.25	C_6, equation coefficient for (t/c) effects
10	1774	0.10	$(t/c)_{ref}$, reference (t/c) for (t/c) effects
11	1775	0.01	K_3, weight factor for volume effects
12	1776	0.10	K_4, equation coefficient for actuator effects
13	1777	0.125	C_7, equation coefficient for actuator effects
14	1778	1.0	N_{act}, number of actuators per panel
15	1779	0.10	$K_{\Delta TE\ UPR}$, weight factor to be applied to fixed trailing edge structure between rear spar and device leading edge to account for weight increment to upper surface of fixed trailing edge structure for aileron, elevator, or rudder installation.
16	1780	0.05	$K_{\Delta TE\ LWR}$, weight factor, same as the foregoing, but for lower surface increment
17	1781	0.0	Not used
18	1782	0.0	Not used
19	1783	0.0	Not used
20	1784	0.0	Not used

TABLE 164. DAILK ARRAY, VARIABLE DATA SUBARRAY, AILERON, ELEVATOR AND RUDDER CONTROL SURFACE ANALYSIS (CONCL)

Array Location	D Array Ref Location	Default Value	Description
Locations 21-25 contain elevator weight equation coefficients			
21	1785	1.40	K_1, elevator weight equation coefficient
22	1786	0.773	C_1, elevator weight equation coefficient
23	1787	0.35	C_2, elevator weight equation coefficient
24	1788	0.3069	C_3, elevator weight equation coefficient
25	1789	0.0	C_4, elevator weight equation coefficient
Locations 26-30 contain rudder weight equation coefficients			
26	1790	1.50	K_1, rudder weight equation coefficient
27	1791	0.02442	C_1, rudder weight equation coefficient
28	1792	0.35	C_2, rudder weight equation coefficient
29	1793	1.36027	C_3, rudder weight equation coefficient
30	1794	0.0	C_4, rudder weight equation coefficient

TABLE 165. DFSP ARRAY, VARIABLE DATA SUBARRAY,
TRAILING EDGE FLAP-TYPE CONTROL SURFACE
SUPPORT STRUCTURE DISTRIBUTION CONSTANTS

General information for array DFSP:

Blank common reference location = D(1795)

Array size = 25 cells

Array contains weight and distribution constants for support tracks, carriages, hinges and fittings for flap-type control surfaces.

Array Location	D Array Ref Location	Default Value	Description
Locations 1-7 contain weight fraction of total estimated device weight that is to be distributed as support-type structures.			
1	1795	0.10	$K_{supt\ wt(0)}$, support weight fraction, type 0 device, plain flap
2	1796	0.28	$K_{supt\ wt(1)}$, support weight fraction, type 1 device, single-slotted flap
3	1797	0.40	$K_{supt\ wt(2)}$, support weight fraction, type 2 device, double-slotted flap
4	1798	0.55	$K_{supt\ wt(3)}$, support weight fraction, type 3 device, triple-slotted flap
5	1799	0.10	$K_{supt\ wt(4)}$, support weight fraction, type 4 device, aileron
6	1800	0.10	$K_{supt\ wt(5)}$, support weight fraction, type 5 device, elevator
7	1801	0.10	$K_{supt\ wt(6)}$, support weight fraction, type 6 device, rudder
Locations 8-14 contain chord factor for aft location of chordwise weight distribution surface for device support structure. Total panel chord dimensions used for device types 0, 1, 4, 5, and 6. Aft panel chord is used as reference chord length for device type 2, double-slotted flaps. Chord distance between leading edge of mid-panel and aft panel trailing edge is used as reference chord length for device type 3, triple-slotted flaps. Support structure weights are distributed between rear spar and coordinate points defined from this data set.			
8	1802	0.10	$K_{supt\ TE(0)}$, type 0 device, plain flap
9	1803	0.15	$K_{supt\ TE(1)}$, type 1 device, single-slotted flap

TABLE 165. DFSP ARRAY, VARIABLE DATA SUBARRAY, TRAILING EDGE FLAP-TYPE CONTROL SURFACE SUPPORT STRUCTURE DISTRIBUTION CONSTANTS (CONCL)

Array Location	D Array Ref Location	Default Value	Description
10	1804	0.20	$K_{supt\ TE(2)}$, type 2 device, double-slotted flap
11	1805	0.20	$K_{supt\ TE(3)}$, type 3 device, triple-slotted flap
12	1806	0.10	$K_{supt\ TE(4)}$, type 4 device, aileron
13	1807	0.10	$K_{supt\ TE(5)}$, type 5 device, elevator
14	1808	0.10	$K_{supt\ TE(6)}$, type 6 device, rudder
Locations 15-21 contain taper ratio constants for chordwise weight distribution surface for device support structure, z_{TE}/z_{RS}.			
15	1809	0.475	λ_0, type 0 device, plain flap
16	1810	0.40	λ_1, type 1 device, single-slotted flap
17	1811	0.30	λ_2, type 2 device, double-slotted flap
18	1812	0.25	λ_3, type 3 device, triple-slotted flap
19	1813	0.475	λ_4, type 4 device, aileron
20	1814	0.475	λ_5, type 5 device, elevator
21	1815	0.475	λ_6, type 6 device, rudder
22	1816	0.0	Not used
23	1817	0.0	Not used
24	1818	0.0	Not used
25	1819	0.0	Not used

TABLE 166. TG ARRAY

General information for array TG:

Blank common reference location = T(1001)

Array size = 300 cells

Array TG contains geometry data used for mass distribution calculations in overlays (14,0), (15,0), and (17,0). Array data are created by subroutine GCNTL, overlay (14,0). They are saved on mass storage file 1, record 146, by subroutine WCØNT, overlay (15,0), to be read into core by subroutine WØDATA, overlay (17,0).

Array Location	Description
	Locations 1 through 44 contain coordinate data for the 11 structural analysis stations.
1-11	$Y_{\Lambda(1-11)}$, structural analysis stations, root to tip
12-22	$Y_{EA(1-11)}$, Y-coordinate for structural analysis stations
23-33	$X_{EA(1-11)}$, X-coordinate for structural analysis stations
34-44	$C_{CS(1-11)}$, X-axis intercept for lines normal to structural reference line and passing through $Y_{\Lambda(1-11)}$
	Locations 45 through 92 contain coordinate data for the 12 control points defining the 11 structural panel strips for flutter optimization program mass distribution computations. $Y'_{\Lambda 1} = Y_{\Lambda 1}$, $Y'_{\Lambda 12} = Y_{\Lambda 11}$ $Y_{\Lambda'(2-11)}$ = coordinate of planform centroid of the 10 structural panels defined by $Y_{\Lambda(1-11)}$.
45-56	$Y'_{\Lambda(1-12)}$
57-68	$Y'_{EA(1-12)}$
69-80	$X'_{EA(1-12)}$
81-92	$C'_{SC(1-12)}$
	Locations 93 through 155 contain planform areas, sq ft/side, for torque-box, leading edge, and trailing edge panels of the 10 structural panels defined by $Y_{\Lambda(1-11)}$.

TABLE 166. TG ARRAY (CONT)

Array Location	Description
93	$\Sigma S'_{TB_S}$, total torque-box planform area, sum of the following panels 1-10
94-103	$S_{TB(1-10)}$, individual torque-box panel planform area
104	$\Sigma S'_{LE_S}$, total true leading edge planform area, sum of panels 1-12. The following panels 1-12 defined by the 11 structural chords, root chord, and tip chord - panels 1-10 between the 11 structural chords, root to tip; panel 11 for segment inboard of station 1; panel 12 for segment outboard of station 11. (Note: for positive sweep of structural reference line, panel 11 is calculated, panel 12 = 0.0. Panel 12 exists for negative sweep, and panel 11 will be 0.0
105-116	$S'_{LE(1-12)}$, individual leading edge panel planform areas, structural reference system
117-129	Same as 104 through 116, except for trapezoidal planform
130	$\Sigma S'_{TE_S}$, total true trailing edge planform area, sum of the following panels 1-12. Same assumptions as for preceding leading edge.
131-142	$S'_{TE(1-12)}$, individual trailing edge panel planform areas, structural reference system.
143-155	Same as 130 through 142, except for trapezoidal planform.
Locations 156 through 265 contain leading and trailing edge chord data and panel areas. X-coordinates and delta chords are computed at Y-coordinates of the 11 structural analysis control stations $Y_{EA(1-11)}$, locations 12 through 22. Panel areas are for panels between these stations. All areas are sq ft/side.	
156-166	$X_{FLE\ (1-11)}$, X-coordinate, true leading edge
167-177	$X_{ALE\ (1-11)}$, X-coordinate, front spar
178-188	$\Delta_{CLE\ (1-11)}$, leading edge chord, distance between front spar and true leading edge
189	$\Sigma S'_{LE}$, total true leading edge planform area, sum of the following panels (1-10)
190-199	$S'_{LE\ (1-10)}$, individual leading edge panel planform areas, aerodynamic reference system

TABLE 166. TG ARRAY (CONCL)

Array Location	Description
200-210	Same as 189-199, except for trapezoidal planform
211-221	$X_{FTE(1-11)}$, X-coordinate, rear spar
222-232	$X_{ATE(1-11)}$, X-coordinate, true trailing edge
233-243	$\Delta C_{TE(1-11)}$, trailing edge chord, distance between true trailing edge and rear spar
244	$\Sigma S'_{TE}$, total true trailing edge planform area, sum of the following panels (1-10)
245-254	$S'_{TE(1-10)}$, individual trailing edge panel planform areas, aerodynamic reference system
255-265	Same as 244-254, except for trapezoidal planform
Locations 266 through 298 contain torque-box cross-sectional data for the 11 structural analysis control stations.	
266-276	$W_{TB\ (1-11)}$, torque-box width, root to tip. Also referenced as TBW, dimension 11.
277-287	$D_{TB\ (1-11)}$, torque-box average depth, root to tip. Also referenced as TBD, dimension 11.
288-298	$XA_{TB\ (1-11)}$, torque-box cross-sectional area, root to tip, sq in.
299-300	Not used

TABLE 167. TGA ARRAY

General information for array TGA:

Blank common reference location = T(1851)

Array size = 135 cells

Array TGA contains geometry data used for mass distribution calculations in overlays (14,0), (15,0) and (17,0). Array data in locations 1 through 42 is created by subroutine GCNTL, overlay (14,0). Data in locations 43 through 135 is created from array CCI data by subroutine FDIS, overlay (15,0), required data to be saved for computations in overlay (17,0). Array data is saved on mass storage file 1, record 145 by subroutine WCØNT, overlay (15,0). Array TGA is recreated from this record by subroutine WØDATA, overlay (17,0).

Array Location	Description
	Locations 1 through 42 contain control station data for mass distribution calculations for flexible loads analysis. Y_{1-11} are coordinates of 11 equally spaced stations between structural analysis control station 1 and the tip station, b/2. These stations define the 10 aerodynamic strips for which mass distribution data are computed as output under data generation option for flexible analysis program. Y-coordinates for panel centroids, locations 23 through 32, re assumed to be at panel midpoints.
1-11	$Y_{(1-11)}$, Y-coordinates for aerodynamic strip boundaries, control stations for mass distribution calculations in aerodynamic system, root to tip.
12-22	$X_{(1-11)}$, X-coordinates of structural reference line for $Y_{(1-11)}$.
23-32	$Y_{CG(1-10)}$, strip centroid Y-coordinate for the 10 panels defined by $Y_{(1-11)}$, mass distribution integration stations for all items within strip.
33-42	$X_{CG(1-10)}$, X-coordinates of structural reference line for $Y_{CG\,(1-11)}$.
	Data in locations 43 through 135 are created from array CCI by subroutine FDIS. They contain torque-box geometry information used to recreate array CCI data in overlay (17,0) for mass distribution integration of final design torque-box weights by subroutine TBFWI. Locations 43 through 119 contain data from array CCI locations 1 through 77, locations 120 through 124 from CCI(97) through CCI(102) and locations 125 through 133 from CCI(127) through CCI(137).

TABLE 167. TGA ARRAY (CONCL)

Array Location	Description
43-53	$Y_{\Lambda(1-11)}$, structural reference line stations, initially created from array TG, locations 1 through 11, reference stations for torque-box weight per inch data
54-64	$X_{\Lambda FS\ (1-11)}$, X_{Λ}-distance to the front spar reference line from the structural analysis stations $Y_{\Lambda(1-11)}$.
65-75	$W_{TB\ (1-11)}$, torque-box width at the 11 structural analysis stations
76-86	$Y_{FS\ (1-11)}$, Y-coordinate for $(Y_{\Lambda}, X_{\Lambda FS})_{(1-11)}$
87-97	$X_{FS\ (1-11)}$, X-coordinate for $(Y_{\Lambda}, X_{\Lambda FS})_{(1-11)}$
98-108	$Y_{RS\ (1-11)}$, Y-coordinate for $(Y_{\Lambda}, X_{\Lambda RS})_{(1-11)}$
109-119	$X_{RS\ (1-11)}$, X-coordinate for $(Y_{\Lambda}, X_{\Lambda RS})_{(1-11)}$
Locations 120-124 contain torque-box integration control data.	
120	ID, control code for type of integration: 0.0 = integration for ΣW, ΣW_X and ΣW_Y in weight analysis reference system only. 1.0 = integration for all mass properties in all three analysis reference systems.
121	N_Y, maximum number of chordwise strips for each torque-box panel, initially created from variable data subarray DINTI, location 1.
122	$\Delta Y_{\Lambda\,min}$, minimum width of chordwise strips for each torque-box panel, initially created from DINTI(4).
123	N_X, maximum number of grids in each chordwise strip, initially created from DINTI(7).
124	$\Delta X_{\Lambda\ min}$, minimum grid height in each chordwise strip, initially created from DINTI(10).
135-135	$D_{ave\ (1-11)}$, torque-box depth at the 11 structural analysis stations.

TABLE 168. YC ARRAY, OVERLAYS (14,0), (15,0), AND (17,0)

General information for array YC:
Blank common reference location = T(201)
Array size = 150 cells
Array data in locations 1 through 92 are created by GEØMC when either linear or nonlinear leading edge options are used. Created data subset size = number of input control stations plus 1.
Data in locations 1 through 92 are used in overlays (14,0), (15,0), and (17,0) for true aerodynamic and structural chord calculations. Arrangement of data used from this array along with the storage of all the data items calculated are different from that of overlay (8,0). Descriptions for array YC used in overlay (8,0) can be found in Section III.
Locations 1 through 40 contain local aerodynamic and structural chord information computed by subroutine CTØT for the using subroutines. Coordinates (Y_i, X_i) defining the planform reference point are specified in array locations TT(1), and TT(2), respectively.

Array Location	Description
	Locations 1 through 10 chord data for the aerodynamic chord at Y_i.
1	X_{LE_C}, true leading edge X-coordinate
2	X_{LE}, leading edge element line X-coordinate for theoretical planform
3	X_{FS}, front spar reference line X-coordinate
4	X_{EA}, structure reference line X-coordinate
5	X_{RS}, rear spar reference line X-coordinate
6	X_{TE}, trailing edge element line X-coordinate for theoretical planform
7	X_{TE_C}, true trailing edge X-coordinate
8	C_{total}, true aerodynamic chord, [YC(7) - YC(1)]
9	C_{trap}, aerodynamic chord for theoretical planform, [YC(6) - YC(2)]
10	C_{box}, torque box chord [YC(5) - YC(3)]

TABLE 168. YC ARRAY, OVERLAYS (14,0), (15,0), AND (17,0) (CONT)

Array Location	Description
	Locations 11 through 31 contain chord data for the structural chord passing through (Y_i, X_i). Structural chord intersection points with the seven spanwise control lines are defined in terms of the Y_i and X_i coordinates.
11	Y_{LE_C}, true leading edge
12	Y_{LE}, theoretical planform leading edge element line
13	Y_{FS}, front spar element line
14	Y_{EA}, structural reference line
15	Y_{RS}, rear spar reference line
16	Y_{TE}, theoretical planform trailing edge element line
17	Y_{TE_C}, true trailing edge
18	X_{LE_C}, true leading edge
19	X_{LE}, theoretical planform leading edge element line
20	X_{FS}, front spar reference line
21	X_{EA}, structural reference line
22	X_{RS}, rear spar reference line
23	X_{TE}, theoretical planform trailing edge element line
24	X_{TE_C}, true trailing edge
25	C_{total}, structural chord for true planform
26	C_{trap}, structural chord for theoretical planform
27	C_{box}, structural chord for torque box
28	C_{C_i}, X-axis intercept line normal to structural reference line and passing through point (Y_i, X_i)
29	$(-1/\text{TAN}\,\Lambda_{EA} - \text{TAN}\,\Lambda_i)$
30	D_{max_i}, maximum airfoil depth as station Y_i
31	$(t/c)_i$, thickness ratio at station Y_i (D_{max_i}/C_{total})
32-40	Not used

TABLE 168. YC ARRAY, OVERLAYS (14,0), (15,0), AND (17,0) (CONCL)

Array Location	Description
41-52	$Y_{LE(1-12)}$, Y-coordinates for the up to 11 input control stations used for defining locations of true planform leading edge. Tip station value is added to data set.
53-64	$X_{LE(1-12)}$, X-coordinates corresponding to stations defined in locations 41 through 52. Tip station coordinate is assumed to be for leading edge element line of theoretical trapezoidal planform.
65-75	$Tan_{LE(1-11)}$, slope of straight lines passed through adjacent points defined by preceding X-, Y-coordinates.
76-86	$C_{LE(1-11)}$, X-axis intercepts for straight lines defined by slopes and preceding X-, Y-coordinates.
87-98	$Y_{TE(1-12)}$, Y-coordinates for trailing edge, similar to preceding locations 41 through 52.
99-110	$X_{TE(1-12)}$, X-coordinate for trailing edge, similar to preceding locations 55 through 64.
111-121	$Tan_{TE(1-11)}$, slope of trailing edge lines, similar to preceding locations 65 through 75.
122-132	$C_{TE(1-11)}$, X-axis intercept for trailing edge lines, similar to preceding locations 76 through 86.
133-150	Not used

TABLE 169. TWG ARRAY

General information for array TWG:

Blank common reference location = T(1301)

Array size = 400 cells

Array TWG contains weight, mass distribution, and 1-g loads data created by overlays (14,0) and (15,0). This array is saved on mass storage file 1, record 147, by subroutine WCØNT, overlay (15,0). It is recreated in overlay (17,0) by subroutine WØDATA from this source.

TWG array locations are initially set to 0.0 by subroutine LEWT, overlay (14,0).

Array Location	Description
	Locations 1 through 9 are used to store exposed panel component weight data computed by overlays (14,0) and (15,0) routines. Computed data, lb/side, are stored in array TWG locations by subroutines identified.
1	ΣW, total outer panel weight, processed by FDIS. Initially set to weight indicated through variable-data value in D(144), subsequently adjusted to sum of computed values in locations 2 through 5.
2	ΣW_{TB}, initial torque-box weight, set up by FDIS.
3	ΣW_{LE}, total estimated leading edge weight, set up by WLETE from CCW(1)
4	ΣW_{TE}, total estimated trailing edge weight, set up by WLETE from CCW(2)
5	ΣW_{TIP}, total estimated tip weight, set up by WCØNT from CCI(91) value calculated by MISCNT.
6	$\Sigma \Delta W_{CDL}$, total incremental structural provision weights for the up to seven concentrated mass items. Set up by CDL during computation loop. This weight is equal to sum of values in locations 10 through 16 and is assumed to be included in preceding ΣW_{TB}.
7-9	Not used
	Locations 10 through 16 contain computed structural provision weights for each of the seven concentrated mass items computed by CDL. Information in location 17 is not created. It is intended to contain incremental weights for tip provisions for T-tail vertical tail and root provisions for T-tail horizontal tails.
10-16	$\Delta W_{CDL(1-7)}$

TABLE 169. TWG ARRAY (CONT)

Array Location	Description
17	$\Delta W_{T\text{-}tail}$, T-tail incremental weight at tip (not created; however, processing provisions are programmed). Set up by WCØNT from TCS(242)
	Locations 18 through 60 contain torque-box distribution data for the seven ΔW_{CDL} items. This data set is created by FDIS.
18-27	ΔW_{CDL}, torque-box panel (1-10). Torque-box panel-point weights of the seven structural provision weights for concentrated masses, distribution based on concentrated mass locations relative to spanwise torque-box panel boundaries.
28-38	$V_{\Lambda(1\text{-}11)}$ (ΔCDL), 1-g shear at the 11 structural analysis stations for preceding panel weights, lb
39-49	$M_{X\Lambda(1\text{-}11)(\Delta CDL)}$, 1-g bending moment for preceding panel weights, in.-lb
50-60	$M_{Y\Lambda(1\text{-}11)(\Delta CDL)}$, 1-g torsional moment for preceding panel weights above, in.-lb
	Locations 61 through 65 will contain 0.0 values transferred from TCS(242) through TCS(246) by WCØNT. Data for these locations are not created. This data set is intended to contain indicated information for incremental structural provision weights for T-tail configurations.
61	$\Delta W_{T\text{-}tail\ prov.}$, lb/side
62	Y_{cg}, Y-coordinate for centroid of preceding weight
63	X_{cg}, X-coordinate for centroid of preceding weight
64	$Y_{\Lambda\ cg}$, Y_{Λ} -coordinate for point (Y_{cg}, X_{cg})
65	$X_{\Lambda\ cg}$, X_{Λ} -coordinate for point (Y_{cg}, X_{cg})
	Locations 66 through 73 contain leading and trailing edge component data created by WLETE from arrays CCW and CCL. This data set is used to create WTLT array data by WØDATA in overlay (17,0). All eight items are stored in terms of pounds per air vehicle.

TABLE 169. TWG ARRAY (CONT)

Array Location	Description
66	$W_{FIX\ LE}$, fixed leading edge structure weight, from CCW(3)
67	W_{D1}, weight of leading edge device 1, from CCL(64)
68	W_{D2}, weight of leading edge device 2, from CCL(65)
69	W_{D3}, weight of leading edge device 3, from CCL(66)
70	$W_{FIX\ TE}$, fixed trailing edge structure weight, from CCW(5)
71	W_{FL}, total weight of trailing edge flaps, from CCW(6)
72	W_{SP}, total weight of spoilers, from CCW(7)
73	W_{AIL}, weight of ailerons for wing, elevators for horizontal tail, and rudders for vertical tail, from CCW(8)
74-85	Not used
Locations 86 through 95 contain initial estimated panel weights for torque-box, created by FDIS from array TCS. This data set is used by WDDATA, overlay (16,0), to initialize subarrays WPNLS and TPNLW.	
86-95	$W_{TB(1-10)}$, initial structure weight estimates for the 10 torque-box-panels, lb/side
Locations 96 through 332 contain data sets for deadweight 1-g shears and moments. The first data set, locations 96 through 128, is computed by FDIS. It contains total 1-g deadweight loads for all components except fuel and expendable concentrated masses (data sets in locations 267 through 332). Data sets in locations 129 through 161 contain initial load estimates for torque-box structures, set up by FDIS from array TCS. Data sets in locations 162 through 233 contain load sets for total leading and trailing edge structures. These sets are set up by LETEI, array TCS data. These two data sets contain 12 items for each load. Second through twelfth items are for the 11 structural analysis stations. The first item is computed at the centerline station, showing the effect of any structures inboard of the first structural cut.	

TABLE 169. TWG ARRAY (CONT)

Array Location	Description
	Data sets in locations 234 through 266 contain loads for miscellaneous contents. These are set up by MISCNT from array CCI, locations 169 through 201. Data set in locations 267 through 299 contains loads for fuel. This data set is computed by FDIS from fuel cell 1 and 2 loads data. The remaining-fuel load factor at DGWØ for each cell (data cells TWG(382) and TWG(395) is used to compute these loads. Data set in locations 300 through 332 contains loads due to concentrated mass items 1 and 2 (the two masses that can be treated as expendable items). The loads set is created by MISCNT from array CCI data using the remaining-mass factor for these two items stored in TCS(228) and TCS(229). Load values are computed in terms of pounds for shear, and inch-pounds for moments.
96-106	$\Sigma V_{\Lambda(1-11)}$, 1-g shear for total outer panel, less fuel and concentrated masses
107-117	$\Sigma M_{X\Lambda(1-11)}$, 1-g bending moment for preceding shear load
118-128	$\Sigma M_{Y\Lambda(1-11)}$, 1-g torsional moment for preceding shear load
129-139	$V_{\Lambda(1-11)(TB)}$, 1-g shear for initial estimate weight of torque-box structures
140-150	$M_{X\Lambda(1-11)(TB)}$, 1-g bending moment for preceding torque-box shear
151-161	$M_{Y\Lambda(1-11)(TB)}$, 1-g torsional moment for preceding torque-box shear
162-173	$V_{\Lambda(0-11)(LE)}$, 1-g shear for total leading edge structures
174-185	$M_{X\Lambda(0-11)(LE)}$, 1-g bending moment for preceding LE shear
186-197	$M_{Y\Lambda(0-11)(LE)}$, 1-g torsional moment for preceding LE shear
198-209	$V_{\Lambda(0-11)(TE)}$, 1-g shear for total trailing edge structures
210-221	$M_{X\Lambda(0-11)(TE)}$, 1-g bending moment for preceding TE shear
222-233	$M_{Y\Lambda(0-11)(TE)}$, 1-g torsional moment for preceding TE shear

TABLE 169. TWG ARRAY (CONT)

Array Location	Description
234-244	$V_{\Lambda(1-11)(MISC)}$, 1-g shear for miscellaneous items (includes tip structure; does not include structural provision weights for concentrated masses).
245-255	$M_{X\Lambda(1-11)(MISC)}$, 1-g bending moment for preceding MISC shear
256-266	$M_{Y\Lambda(1-11)(MISC)}$, 1-g torsional moment for preceding MISC shear
267-277	$V_{\Lambda(1-11)(FUEL)}$, 1-g shear for design fuel in cells 1 and 2 at DWGØ
278-288	$M_{X\Lambda(1-11)(FUEL)}$, 1-g bending moment for preceding fuel shear
289-299	$M_{Y\Lambda(1-11)(FUEL)}$, 1-g torsional moment for preceding fuel shear
300-310	$V_{\Lambda(1-11)(CDL\ 1,2)}$, 1-g shear for design weight for concentrated mass items 1 and 2 at DGWØ
311-321	$M_{X\Lambda(1-11)(CDL\ 1,2)}$, 1-g bending moment for preceding CDL shear
322-332	$M_{Y\Lambda(1-11)(CDL\ 1,2)}$, 1-g torsional moment for preceding CDL shear
Locations 333 through 367 contain weight-per-inch data sets for leading edge, trailing edge, and torque-box structures. These data sets are used by WDDATA, overlay (16,0), to create array data in subarrays WPILE, WPITE, and TBWPI. The torque-box data set is created by FDIS based on initial torque-box weight estimate. LE and TE data sets contain 12 items. These are average wt/in. for the 12 LE and TE panels stored in array TCS, locations 1-12. Each panel weight is divided by corresponding panel spanwise length in the structural reference system. LE and TE wt/in. information printed by PRTA, overlay (9,0), or ACPRTA, overlay (18,0), on outer panel design summary page is obtained from these data sets.	
333-344	Wt/in.(0-11)(LE), spanwise distribution of total leading edge structures, average panel spanwise unit weight
345-356	Wt/in.(0-11)(TE), spanwise distribution of total trailing edge structures, average panel spanwise unit weight
357-367	Wt/in.(1-11)(TB), spanwise distribution of torque-box structures, initial weight estimate
Locations 368 through 374 contain data processing code information for the seven concentrated masses. This data set is created by subroutine MISCNT from array TCS, locations 228 through 234.	

TABLE 169. TWG ARRAY (CONT)

Array Location	Description
368-374	$K_{WT(1-7)}$, data processing code for concentrated masses 1-7: 0.0 = no mass exists +1.0 = compute all mass distribution information -1.0 = compute structural provisions only
Locations 375 through 400 contain design data for fuel cells 1 and 2. Subroutine FDIS creates these data sets from array CCI, locations 114 through 126, after evaluation process for each fuel cell. Subroutine WDDATA uses these data sets to create array data for subarray TFLD. Processing of fuel mass properties by subroutines WFLDD and WVFDD, overlay (17,0), is based on information in this data set. All fuel cell data are computed and stored as per side values.	
(375-387)	Fuel cell 1, same as CCI(114) through CCI(126) for fuel cell 1.
375	Y_{IB}, Y-coordinate of structural reference line identifying location of inboard closeout rib for fuel cell 1.
376	$Y_{ØB}$, Y-coordinate of structural reference line identifying location of outboard closeout rib for fuel cell 1.
377	X_{IB}, X-coordinate corresponding to preceding Y_{IB}
378	$X_{ØB}$, X-coordinate corresponding to preceding $Y_{ØB}$
379	ΔY_A, Y-station increment, $(Y_{ØB}-Y_{IB})/10.0$
380	$W_Ø$, computed fuel capacity of cell, based on input density
381	$K_Ø$, $(W_{cap}+W_{FS})/(W_Ø)$, full-capacity scaling factor to adjust initial value of calculated mass distribution data to sum of required full-capacity plus fuel system weights
382	K_{DES}, $(W_{DES}+W_{FS})/(W_{total})$, design capacity scaling factor to adjust full-capacity mass distribution data to fuel cell load at DGWØ
383	W_{total}, $(W_{cap}+W_{FS})$, full-capacity weight, sum of full-capacity fuel plus fuel-system weight
384	$W_{DES\ total}$, $(W_{DES}+W_{FS})$, design capacity weight, sum of fuel load at DGWØ plus fuel system weight
385	W_{cap}, required full-capacity fuel weight for cell. If not specified in input data set, calculated value is used. If specified, smaller of input value and calculated capacity is used.

TABLE 169. TWG ARRAY (CONCL)

Array Location	Description
386	W_{DES}, design fuel load at DGWØ as specified in item 4 of input data set
387	W_{FS}, fuel system weight associated with fuel cell 1, assumed to be distributed proportional to fuel distribution surface
(388-400)	Fuel cell 2, same as CCI(114) through CCI(126) and data set in locations 375 through 387
388	Y_{IB}
389	$Y_{ØB}$
390	X_{IB}
391	$X_{ØB}$
392	Δ_{YA}
393	$W_{Ø}$
394	$K_{Ø}$
395	K_{DES}
396	W_{total}
397	$W_{DES\ total}$
398	W_{cap}
399	W_{DES}
400	W_{FS}

TABLE 170. CCW ARRAY

General information for array CCW:

Blank common reference location = CD(1)

Array size = 50 cells

Array CCW contains leading and trailing edge structure weight summary information created in overlay (14,0) by subroutines WLETE, LEWT, TEWT, TEWTI, and LETEI. This array is saved on mass storage file 1, record 148, by subroutine WCØNT, overlay (15,0). It is recreated in overlay (17,0) by subroutine WØDATA from this source for processing of LE and TE data by that subroutine.

CCW array locations are initially set to 0.0 by subroutine LEWT.

Array Location	Description
	Locations 1 through 16 contain weights and unit weights for LE and TE structures. Weight data set is initially computed as pounds per side values by computing routines and converted to pounds per air vehicle values by subroutine WLETE.
1	ΣW_{LE}, total leading edge structure weight
2	ΣW_{TE}, total trailing edge structure weight
3	$W_{FIX\ LE}$, fixed leading edge structure weight
4	$\Sigma W_{DEV\ LE}$, total leading edge device weight
5	$W_{FIX\ TE}$, fixed trailing edge structure weight
6	$\Sigma W_{FL\ TE}$, total trailing edge flaps, sum of input flap-type device sets 1, 2, and 3. (NOTE: Subroutine nomenclature for these devices is trailing edge devices 3, 4, and 5.)
7	W_{AIL}, aileron weight for wing, elevators for horizontal tail, and rudders for vertical tails specified by input flap-type device sets 4, 5, or 6. (NOTE: Subroutine nomenclature for this device is trailing edge device 6.)
8	ΣW_{SP}, spoiler weights, sum of input spoiler devices 1 and 2, internally identified as trailing edge devices 1 and 2.
9	$(W/S)_{LE}$, unit weight for total leading edge structures, weight in location 1 divided by area in location 17.
10	$(W/S)_{TE}$, unit weight for total trailing edge structure, weight in location 2 divided by area in location 18.
11	$(W/S)_{FIX\ LE}$, unit weight for fixed leading edge structures, weight in location 3 divided by area in location 19.

TABLE 170. CCW ARRAY (CONT)

Array Location	Description
12	$(W/S)_{DEV\ LE}$, average unit weight for leading edge devices, total weight in location 4 divided by sum of device planform areas in location 20.
13	$(W/S)_{FIX\ TE}$, unit weight for fixed trailing edge structures, weight in location 5 divided by area in location 21.
14	$(W/S)_{FL\ TE}$, average unit weight for trailing edge flaps, total weight in location 6 divided by total device planform area in location 22.
15	$(W/S)_{AIL}$, unit weight for aileron-type devices, weight in location 7 divided by area in location 23.
16	$(W/S)_{SP}$, average unit weight for spoiler devices, total weight in location 8 divided by total device planform area in location 24.
Locations 17 through 26 contain computed planform areas for leading and trailing edge items identified in locations 1 through 8. These area values are initially computed in terms of square feet per side and subsequently converted to square feet per air vehicle values by WLETE.	
17	S_{LE}, total planform area for leading edge
18	S_{TE}, total planform area for trailing edge
19	$S_{FIX\ LE}$, planform area for fixed leading edge, total area less segments deleted for leading edge devices
20	$S_{DEV\ LE}$, total leading edge device planform area, sum of areas for devices, 1, 2, and 3.
21	$S_{FIX\ TE}$, planform area for fixed trailing edge, total area less segments deleted for trailing edge devices
22	$S_{FL\ TE}$, total planform area for trailing edge flap-type devices, internally identified as TE devices 3, 4, and 5.
23	S_{AIL}, planform area for aileron-type device, internally identified as TE device 6.
24	S_{SP}, total planform area for spoiler-type devices, internally identified as TE devices 1 and 2.

TABLE 170. CCW ARRAY (CONT)

Array Location	Description
25	S_{LE} trap, total planform area of leading edge, based on trapezoidal planform
26	S_{TE} trap, total planform area of trailing edge, based on trapezoidal planform
Locations 27 through 42 contain CG coordinates (Y,X) for the eight weight items in locations 1 through 8.	
27	Y_{CG} for ΣW_{LE}
28	X_{CG} for ΣW_{LE}
29	Y_{CG} for ΣW_{TE}
30	X_{CG} for ΣW_{TE}
31	Y_{CG} for $W_{FIX\ LE}$
32	X_{CG} for $W_{FIX\ LE}$
33	Y_{CG} for $\Sigma W_{DEV\ LE}$
34	X_{CG} for $\Sigma W_{DEV\ LE}$
35	Y_{CG} for $W_{FIX\ TE}$
36	X_{CG} for $W_{FIX\ TE}$
37	Y_{CG} for $\Sigma W_{FL\ TE}$
38	X_{CG} for $\Sigma W_{FL\ TE}$
39	Y_{CG} for W_{AIL}
40	X_{CG} for W_{AIL}
41	Y_{CG} for ΣW_{SP}
42	X_{CG} for ΣW_{SP}
Locations 43 through 49 contain type-of-device identification code for leading and trailing edge devices. This data set is created by subroutine LEWT, locations 43, 44, and 45, and by subroutine TEWTI, locations 46 through 49. These control codes are used by subroutine WLETE to identify device type during output print of calculated leading and trailing edge summary information under control of IP(12), control card 2, column 12. Set created by LEWT is device type for each of the	

TABLE 170. CCW ARRAY (CONCL)

Array Location	Description
	three sets of devices, internally identified as leading edge device 1, 2, and 3. Code value definitions are: 1.0 = leading edge slats 2.0 = leading edge kruger flaps 3.0 = droop leading edge Trailing edge sets created by TEWTI are for flap/aileron-type devices, internally identified as trailing edge device 3, 4, 5, and 6. Code value definitions are: 0.0 = simple flaps 1.0 = single-slotted flaps 2.0 = double-slotted flaps 3.0 = triple-slotted flaps 4.0 = aileron 5.0 = elevator 6.0 = rudder
43	N_{LE1}, device-type code for LE device 1.
44	N_{LE2}, device-type code for LE device 2.
45	N_{LE3}, device-type code for LE device 3.
46	N_{TE3}, device-type code for TE device 3.
47	N_{TE4}, device-type code for TE device 4.
48	N_{TE5}, device-type code for TE device 5.
49	N_{TE6}, device-type code for TE device 6.
50	Not used

TABLE 171. CCI, CCL, and CCT ARRAYS, OVERLAY (14,0)

General information for arrays CCI, CCL, and CCT:

Blank common reference location: CCI = CD (1651)
CCL = CD (51)
CCT = CD (351)

Array size = 300 cells

Arrays CCI, CCL, and CCT all contain same type of information. CCI is working array for overlay (14,0) subroutines that compute leading and trailing edge mass distribution data. CCL and CCT are temporary storage routines for CCI data computed for LE and TE structures, respectively. Array CCL is created by subroutine LEWT, array CCT by subroutine TEWT. Both arrays are used by mass integration subroutine LETEI to recreate CCI array data during separate calculation passes for mass properties integration programmed in LETEI.

Array CCI is created by both subroutines LEWT and TEWT. It contains necessary weight and control geometry information for all LE and TE structural components. Data sets created for storage of each type of control surface device data are sized to contain information for up to six separate devices stored in consecutive cell locations. However, number of LE devices is limited to three. In TE control device analysis, each cell location in data sets refer to a specific type of TE device.

All weight data are computed in terms of weight per side.

CCI array locations are set to 0.0 by subroutines LEWT and TEWT.

Array Location	Description
	Locations 1 through 63 contain fixed structure panel weight, distribution, and control geometry data. These data sets describe fixed structure without any control surface devices. Panels are the 10 planform segments with parallel aerodynamic chords that are defined by Y-coordinates for the 11 structural analysis stations. Spanwise and chordwise distribution parameters are computed in aerodynamic reference system.
1	ΣW_{basic}, total weight of fixed structures, sum of $W_{pnl\ (1-10)}$, following
2-11	$W_{pnl\ (1-10)}$, panel weights for the 10 aerodynamic LE or TE strips defined by Y_{EA}(1-11)

TABLE 171. CCI, CCL, and CCT ARRAYS, OVERLAY (14,0) (CONT)

Array Location	Description
12-21	TAN $Z_{pnl\ (1\text{-}10)}$, slope of spanwise distribution line for the 10 panels, based on weight per inch ordinates at inboard and outboard stations of each panel. Each weight ordinate is computed as product of unit weight, lb/sq in., times true panel chord at control stations.
22-31	$C_{Z\ (1\text{-}10)}$, X-axis intercept corresponding to preceding slope for the 10 panel weight distribution lines
32-41	$\lambda_{X(1\text{-}10)}$, taper ratio for chordwise distribution of spanwise weight ordinates for each panel, $\lambda = Z_{AFT}/Z_{FWD}$
42-52	$X_{FWD\ (1\text{-}11)}$, X-coordinate for forward panel control point at $Y_{EA\ 1\text{-}11}$, computed location for true leading edge for LE panels, or rear spar for TE panels..
53-63	$X_{AFT\ (1\text{-}11)}$, X-coordinate for aft panel control point at $Y_{EA\ 1\text{-}11}$, front spar for LE panels, or computed location for true trailing edge for TE panels

Locations 64 through 147 contain weight, distribution, and control geometry data for up to six control surface devices.

Array Location	Description
64-69	$W_{DEV\ (1\text{-}6)}$, weight for each of the separate control devices, 1, 2, and 3 for LE, 1 through 6 for TE. The variable input data array D locations for data sets corresponding to these are:
70-75	$(W/S)_{DEV\ (1\text{-}6)}$, device unit weight, lb/sq ft
76-81	$S_{DEV\ (1\text{-}6)}$, device planform area, lb/sq ft

(Data set locations for 64-69:)

Device No.	LE	TE
1	D(1500-1509)	D(1580-1594)
2	D(1510-1519)	D(1595-1609)
3	D(1520-1529)	D(1610-1629)
4	-	D(1630-1649)
5	-	D(1650-1669)
6 (Wing = aileron	-	D(1670-1689)
(Hori = elevator)		D(1690-1709)
(Vert = rudder)		D(1710-1729)

TABLE 171. CCI, CCL, and CCT ARRAYS, OVERLAY (14,0) (CONT)

Array Location	Description
82-87	Y_{IB} (1-6), Y-coordinate for inboard edge of device
88-93	$Y_{\emptyset B}$ (1-6), Y-coordinate for outboard edge of device
94-99	Y_{CG} (1-6), Y-coordinate for centroid of device weight
100-105	X_{CG} (1-6), X-coordinate for centroid of device weight
106-111	TAN Z_{DEV} (1-6), slope of spanwise distribution line for each device
112-117	$C_{Z\ DEV}$ (1-6), X-axis intercept corresponding to preceding slopes
118-123	$\lambda_{X\ DEV}$ (1-6), taper ratio for chordwise distribution of spanwise weight ordinates for each device, $\lambda = Z_{FWD}/Z_{AFT}$
124-129	TAN $X_{FWD\ DEV}$ (1-6), slope of forward control line defining device LE
130-135	$C_{X\ FWD\ DEV}$ (1-6), X-axis intercept corresponding to preceding slopes for forward control lines
136-141	TAN $X_{AFT\ DEV}$ (1-6), slope of aft control line defining device TE
142-147	$C_{X\ AFT\ DEV}$ (1-6), X-axis intercept corresponding to preceding slopes for aft control lines
Locations 148 through 219 contain weight, distribution, and control geometry data for processing of fixed structures to be deleted and replaced with control surface devices.	
148-153	$W_{\Delta FIX}$ (-)(1-6)
154-159	$(W/S)_{\Delta FIX}$ (-)(1-6)
160-165	$S_{\Delta FIX}$(-)(1-6)
166-171	$Y_{CG\ \Delta FIX}$(-)(1-6)
172-177	$X_{CG\ \Delta FIX}$(-)(1-6)
178-183	TAN $Z_{\Delta FIX}$(-)(1-6)
184-189	$C_{Z\ \Delta FIX}$(-)(1-6)
190-195	$\lambda_{X\ \Delta FIX}$(-)(1-6)
196-201	TAN $X_{FWD\ \Delta FIX}$(-)(1-6)

TABLE 171. CCI, CCL, and CCT ARRAYS, OVERLAY (14,0) (CONT)

Array Location	Description
202-207	$C_{X\ FWD}$ ΔFIX(-)(1-6)
208-213	TAN X_{AFT} ΔFIX(-)(1-6)
214-219	$C_{X\ FWD}$ ΔFIX(-)(1-6)
	Locations 220 through 291 contain weight, distribution, and control geometry data for processing of incremental fixed TE structures to be added to basic fixed TE panel weights. This data set is created during processing of TE devices only and in accordance to type-of-device and input control information.
220-225	$W_{\Delta FIX}$ (+)(1-6)
226-231	$(W/S)_{\Delta FIX}$(+)(1-6)
232-237	$S_{\Delta FIX}$(+)(1-6)
238-243	Y_{CG} ΔFIX(+)(1-6)
244-249	X_{CG} ΔFIX(+)(1-6)
250-255	TAN $Z_{\Delta FIX}$(+)(1-6)
256-261	C_Z ΔFIX(+)(1-6)
262-267	λ_X ΔFIX(+)(1-6)
268-273	TAN X_{FWD} ΔFIX(+)(1-6)
274-279	$C_{X\ FWD}$ ΔFIX(+)(1-6)
280-285	TAN X_{AFT} ΔFIX(+)(1-6)
286-291	$C_{X\ FWD}$ ΔFIX(+)(1-6)
	Locations 292 through 295 contain grid size control data created from subarray DINTI of variable input data array D, locations 1143 through 1154.
292	N_Y, maximum number of chordwise strips for each panel, DINTI(2) for LE and DINTI(3) for TE
293	ΔY_{min}, minimum width of chordwise strips for each panel, DINTI(5) for LE and DINTI(6) for TE

TABLE 171. CCI, CCL, and CCT ARRAYS, OVERLAY (14,0) (CONCL)

Array Location	Description
294	N_X, maximum number of grids in each chordwise strip, DINTI(8) for LE and DINTI(9) for TE
295	ΔX_{min}, minimum grid height in each chordwise strip, DINTI(11) for LE and DINTI(12) for TE
Locations 296 through 300 contain data created and used during computations of basic fixed structure weights by subroutines LEWT and TEWT.	
296	$K_{W/S}$, computed weight factor to be applied to basic calculated $(W/S)_\emptyset$ value. If (W/S) is input, only input $K_{W/S}$, item 22 of fixed LE and TE input data sets, is used.
297	(W/S), computed or input basic unit weight, including applicable $K_{W/S}$, lb/sq in.
298	$\Delta C_{cp}/\Delta C_{ave}$, average chordwise centroid location for basic weight, fraction of average chord from forward control line, computed as $CP = (1 + 2\lambda)/(3 + 3\lambda)$, where λ = input value, location 229
299	λ_{XCP}, taper ratio for average chordwise distribution of basic fixed structure, input value, item 3 of fixed LE and TE input data sets
300	C_{ave}, average fixed structure chord computed at Y-station $= 1/2\ (Y_1 + Y_{11})$

TABLE 172. TCS ARRAY, OVERLAY (14,0)

General information for array TCS:

Blank common reference location = CD(1401)

Array size = 250 cells

Array TCS contains mass distribution data resulting from numerical integration procedures programmed in subroutine LETEI for leading edge and trailing edge structures. Mass distribution data are computed and stored for each distribution panel defined for weight analysis, flutter optimization, and flexible loads analysis reference systems.

Array TCS data are used by LETE2 to create LE and TE data in arrays CLEI, CTEI, CIØY for use by overlay (17,0) subroutine WØDATA, WVFDD, and WFLDD.

Array Location	Description
	Locations 1 through 36 contain weight and moment data for LE or TE structures integrated in the weight analysis system. This data set contains weight and moment data for 12 panels defined by the 11 structural analysis control stations, centerline station, and tip station. Panel (0) is defined by the X-axis and the structural chord defined by control station 1, $Y_{\Lambda 1}$. Panel (11) is defined by the structural chord of control station 11, $Y_{\Lambda 11}$, and the aerodynamic tip chord. Any LE or TE structures within these panels are assigned to these panels.
1	$\Sigma W_{pnl(0)}$, weight of structure inboard of structural chord.
2-11	$\Sigma W_{pnl(1-10)}$, weight of structure between control stations 1 and 11
12	$\Sigma W_{pnl(11)}$, weight of structure outboard of structural chord 11
13-14	$\Sigma(W \cdot \Delta Y_{\Lambda})_{(0-11)}$, sum of grid spanwise moments for each of the 12 preceding panels. Moments are computed at inboard control station, $Y_{\Lambda i}$, for each panel.
25-36	$\Sigma(W \cdot \Delta X_{\Lambda})_{(0-11)}$, sum of grid chordwise moments for each of the 12 preceding panels. Moments are computed at inboard control station, $X_{\Lambda i} = 0$, for each panel.

Array Location	Description
Locations 37 through 113 contain weight, moment, and inertia data for LE or TE structures integrated in the flutter optimization reference system. This data set contains data for the 11 structural strip panels defined for the 11 structural synthesis control stations, $Y_{\Lambda(1-11)}$, (TG(1) - TG(11)). The spanwise panel boundaries are defined by $Y'_{\Lambda(1-12)}$, (TG(45) - TG(56)). All weights, moments and inertia are summed to the structural synthesis control points for the panel, ($Y_{\Lambda i}$, $X_{\Lambda i} = 0$).	
37-47	$\Sigma W_{pnl(1-11)}$, sum of grid weights for structural strip panels defined for flutter optimization program
48-58	$\Sigma(W \cdot \Delta Y_{\Lambda})_{(1-11)}$, sum of grid spanwise moments for each of the 11 flutter optimization panels, moments computed at structural synthesis control station, $Y_{\Lambda i}$, of panel
59-69	$\Sigma(W \cdot \Delta X_{\Lambda})_{(1-11)}$, sum of grid chordwise moments computed at structural synthesis control station, $X_{\Lambda i}=0$, for each panel
70-80	$\Sigma(W \cdot \Delta X_{\Lambda}^2)_{(1-11)}$, and $\Sigma(I_Y)_{(1-11)}$. Initially, sum of second weight moment for pitch inertia calculations. Final value is the pitch inertia, $I_{Yi} = \Sigma(W \cdot \Delta X^2)_i + \Sigma(I_{OY})_i$
81-91	$\Sigma(W \cdot \Delta Y_{\Lambda}^2)_{(1-11)}$ and $\Sigma(I_X)_{(1-11)}$, roll inertia data
92-102	$\Sigma(I_{OY_{\Lambda}})_{(1-11)}$ sum of grid pitch (I_O)'s
103-113	$\Sigma(I_{OX\Lambda})_{(1-11)}$, sum of grid roll (I_O)'s
Locations 114 through 190 contain weight, moment, and inertia data for LE or TE structures integrated in the flexible loads analysis reference system. This data set is sized to contain data for 11 aerodynamic strip panels; however, data are computed for only 10 panels as defined by (Y,X) coordinates in TGA(1)-TGA(42). Data are stored in first 10 locations of each subset.	
114-123	$\Sigma W_{pnl(1-10)}$, sum of grid weights for aerodynamic strip panels defined for flexible loads analysis program
124	Not used
125-134	$\Sigma(W \cdot \Delta Y)_{(1-10)}$, sum of grid spanwise moments for each of the 10 flexible loads analysis panels, moments computed at panel control station, Y_i, defined in TGA(23)-TGA(32).

TABLE 172. TCS ARRAY, OVERLAY (14,0) (CONCL)

Array Location	Description
135	Not used.
136-145	$\Sigma(W \cdot \Delta X)_{(1-10)}$, sum of grid chordwise moments computed at panel control station, X_i, defined in TGA(33)-TGA(42)
146	Not used.
147-156	$\Sigma(W \cdot \Delta X^2)_{(1-10)}$, and $(I_Y)_{(1-10)}$, Initially, sum of second weight moment for pitch inertia calculations. Final value is pitch inertia, $I_{Yi} = \Sigma(W \cdot \Delta X^2)_i + \Sigma(I_{OY})_i$
157	Not used
158-167	$\Sigma(W \cdot \Delta Y^2)_{(1-10)}$ and $\Sigma(I_X)_{(1-10)}$, roll inertia data
168	Not used
169-178	$\Sigma(I_{OY})_{(1-10)}$, sum of grid pitch (I_O)'s
179	Not used
180-189	$\Sigma(I_{OX})_{(1-10)}$, sum of grid roll (I_O)'s
190	Not used
	Locations 192 through 227 contain shear and moment data for LE or TE structures computed from panel integration results stored in locations 1 through 36.
192	$V_{A(0)}$, 1-g shear at centerline
193-203	$V_{A(1-11)}$, 1-g shear at structural analysis control stations $Y_{A(1-11)}$.
204-215	$M_{XA(0-11)}$, 1-g bending moments for preceding shears
216-227	$M_{YA(0-11)}$, 1-g torsional moments for preceding shears
	Locations 228 through 237 contain yaw inertia data computed for the 10 aerodynamic strips defined for flexible loads analysis program
228-237	$\Sigma(I_Z)_{(1-10)}$, sum of grid yaw inertia computed at control stations (Y_i, X_i) defined in TGA(23) - TGA(42).
238-250	Not used

TABLE 173. CKD ARRAY, SUBROUTINE LETEI

General information for array CKD:

Blank common reference location = CD(1951)

Array size = 50 cells

Array CKD is used by subroutine LETEI, overlay (14,0), for storage and retrieval of local airfoil depth data used during integration loops of leading and trailing edge structure weights. Parameter values for depth variations stored in locations 1 through 40 are created from array TFRDK for each integration pass. Locations 41 through 50 are used for storage of pertinent parameter values computed during integration of LE and TE structures.

Array Location	Description
1-10	Tan $KD_{FWD(1-10)}$, from TFRDK(1)-TFRDK(10) for LE and TFRDK(41)-TFRDK(50) for TE
11-20	$C_{KD\ FWD(1-10)}$, from TFRKD(11)-TFRDK(20) for LE and TFRDK(51)-TFRDK(60) for TE
21-30	Tan $KD_{AFT\ (1-10)}$, from TFRDK(21)-TFRDK(30) for LE and 0.0 for TE
31-40	C_{KDAFT} (1-10), from TFRDK(31)-TFRDK(40) for LE and 0.0 for TE
41	KD_{FWD_i} at station Y_i
42	KD_{AFT_i} at station Y_i
43	Tan KD_i, chordwise KD slope at strip $\left[(KD_{AFT}-KD_{FWD})/\Delta X\right]$
44	KD at station (Y_i,X_i), depth factor at grid centroid
45	$K_{\emptyset}(KD)^2$
46	$K_{\emptyset}$ for component, from DKDIN(2) for LE and DKDIN(3) for TE
47	$W_{grid} \cdot K_{\emptyset}\ (KD)^2$, weight $(I_{\emptyset})$ term for local airfoil depth effect for each grid
48-50	Not used

TABLE 174. CLEI and CTEI ARRAYS

General information for arrays CLEI and CTEI:

Blank common reference locations: CLEI = CD(651)
CTEI = CD(801)

Array sizes = 150 cells

Arrays CLEI and CTEI contain mass distribution data for leading edge and trailing edge structures created by subroutine LETEI from computed data stored in array TCS. CLEI and CTEI are saved on mass storage file 1, records 149 and 150, by subroutine WLETE. The arrays are recreated from this source by subroutine WØDATA for overlay (17,0) computations.

Array Location	Description
Locations 1 through 36 contain mass distribution data integrated in the weight analysis-reference system. This data set is created from array TCS, locations 1 through 36.	
1-12	$\Sigma W_{pnl\ (0-11)}$, weight analysis reference system
13-24	$\Sigma(W \cdot \Delta Y_{\Lambda})(0-11)$
25-36	$\Sigma(W \cdot \Delta X_{\Lambda})(0-11)$
Locations 37 through 91 contain mass distribution data integrated in the flutter optimization reference system. This data set is created from array TCS, locations 37 through 91.	
37-47	$\Sigma W_{pnl\ (1-11)}$, flutter optimization reference system
48-58	$\Sigma(W \cdot \Delta Y_{\Lambda})_{(1-11)}$
59-69	$\Sigma(W \cdot \Delta X_{\Lambda})_{(1-11)}$
70-80	$\Sigma(I_{Y\Lambda})_{(1-11)}$
81-91	$\Sigma(I_{X\Lambda})_{(1-11)}$
Locations 92 through 146 contain mass distribution data integrated in the flexible loads analysis reference system. This data set is created from array TCS, locations 114 through 168.	
92-101	$\Sigma W_{pnl\ (1-10)}$, flexible loads analysis reference system
102	0.0
103-112	$\Sigma(W \cdot \Delta Y)_{(1-10)}$
113	0.0
114-123	$(W \cdot \Delta X)_{(1-10)}$

TABLE 174. CLEI and CTEI ARRAYS (CONCL)

Array Location	Description
124	0.0
125-134	$\Sigma(I_Y)_{(1-10)}$
135	0.0
136-145	$\Sigma(I_X)_{(1-10)}$
146	0.0
147-150	Not used

TABLE 175. CIØY ARRAY

General information for array CIØY: Blank common reference location = T(501) in overlays (14,0), (15,0), and (16,0). CD (1401) in overlay (17,0). Array size = 150 cells Array CIØY contains yaw inertia data, I_Z, computed in overlays (14,0) and (15,0) for use in overlay (17,0) for total weight, CG, and inertia computations by subroutine WØDATA. This array also contains mass distribution data for concentrated masses. Array CIØY is saved on mass storage file 1, record 190, by subroutine WDDATA, overlay (16,0). This record is read into core by WØDATA, updated with final torque-box (I_Z)'s and rewritten. Array CIØY is subsequently recreated by WØDATA for total surface mass distribution calculations. Array CIØY is initialized to 0.0 by subroutine WLETE.	
Array Location	Description
Locations 1 through 70 contain yaw inertia for the 10 aerodynamic panels defined for flexible loads analysis.	
1-10	$\Sigma(I_Z)_{TB(1-10)}$, torque-box structures, created by WØDATA from TCS(201)-TCS(210).
11-20	$\Sigma(I_Z)_{LE(1-10)}$, leading edge structures, created by LETEI from TCS(228)-TCS(237).
21-30	$\Sigma(I_Z)_{TE(1-10)}$, trailing edge structures, created by LETEI from TCS(228)-TCS(237)
31-40	$\Sigma(I_Z)_{MISC(1-10)}$, miscellaneous contents, created by MISCIT from CKD(21)-CKD(30)
41-50	$\Sigma(I_Z)_{CDL(1-10)}$, concentrated masses, created by CDL from CKD(31)-CKD(40)
51-60	$\Sigma(I_Z)_{FL1(1-10)}$, fuel in cell 1, created by FDIS from TCS(201)-TCS(210)
61-70	$\Sigma(I_Z)_{FL2(1-10)}$, fuel in cell 2, created by FDIS from TCS(201)-TCS(210)
Locations 71 through 120 contain mass distribution data for deleted weights of concentrated mass items 1 and 2 at the design point for flexible loads analysis. This data set is computed by subroutine CDL, overlay (15,0). Values are added to distribution data for concentrated masses stored in array CMII, flexible loads analysis set, for computations of total panel and CG computations by subroutine WØDATA, overlay (17,0).	

TABLE 175. CIØY ARRAY (CONCL)

Array Location	Description
71-80	$\Sigma\Delta W_{CDL\ 1,2\ pnl(1-10)}$, flexible loads analysis reference system panel weights for that portion of concentrated mass items 1 and 2 which are deleted for mass status at the design condition for flexible loads analysis. Weights in affected panels are based on "beamed reaction" weight at panel CG's that straddle concentrated mass CG.
81-90	$\Sigma(\Delta W\text{-}Y)_{CDL\ 1,2\ pnl(1-10)}$, first mass moment for preceding weights
91-100	$\Sigma(\Delta W\text{-}X)_{CDL\ 1,2\ pnl(1-10)}$, first mass moment for preceding weights
101-110	$\Sigma(I_Y)_{CDL\ 1,2\ pnl(1-10)}$, pitch inertia for preceding weights
111-120	$\Sigma(I_X)_{CDL\ 1,2\ pnl(1-10)}$, roll inertia for preceding weights
121-150	Not used

TABLE 176. TGR ARRAY, SUBROUTINE LEWT

General information for array TGR:

Blank common reference location = T(1751)

Array size = 100

Array TGR is used for storage and retrieval of input variable data for analysis of fixed leading edge and leading edge control surfaces. Subarray TLED, dimension 25, is assigned to locations TGR(51)-TGR(75). This subarray contains variable data from array DLE for fixed leading edge analysis and from arrays DLED1 and DLEDK for control surface analysis. Locations 1-50 and 76-78 are used for storage of calculated data.

Array Location	Subarray TLED Location	Fixed Leading Edge Analysis	Leading Edge Control Surface Analysis
1	-	z_{root}, fixed weight/inch at inboard control station.	ΔW_{LE}, fixed structure weight to be deleted for device i
2	-	z_2	Y_{CG}, centroid for deleted weight
3	-	z_3	X_{CG}, centroid for deleted weight
4	-	z_4	z_{IB}, fixed structure weight/inch, inboard station of device
5	-	z_5	$z_{\emptyset B}$, fixed structure weight/inch outboard station of device
6	-	z_6	Δz_{IB}
7	-	z_7	$\Delta z_{\emptyset B}$
8	-	z_8	$z_{LE\ IB}$, ordinate of weight distribution surface at Y_{IB}, X_{LE}
9	-	z_9	$z_{LE\ \emptyset B}$, ordinate of weight distribution surface at Y_{IB}, X_{LE}
10	-	z_{10}	$z_{FS\ IB}$
11	-	z_{11}	$z_{FS\ \emptyset B}$
12	-	-	$z_{\Delta C\ IB}$, ordinate of weight distribution surface at Y_{IB} and fixed LE weight deletion X-control station defined by the input data in TLED(7)
13	-	-	$z_{\Delta C\ \emptyset B}$, same as the foregoing except at $Y_{\emptyset B}$ and X(TLED(8))

TABLE 176. TGR ARRAY, SUBROUTINE LEWT (CONT)

Array Location	Subarray TLED Location	Fixed Leading Edge Analysis	Leading Edge Control Surface Analysis
14	–	–	$X_{CG\ IB}$, centroid of deleted part of fixed LE surface at the inboard station
15	–	–	$X_{CG\ \emptyset B}$, same as the foregoing except at outboard station
16	–	–	$\lambda_{\Delta WT}$, spanwise taper ratio of deleted LE weights, $\Delta Z_{\emptyset B}/\Delta Z_{IB}$
17	–	–	$\lambda_{\Delta WT\ IB}$, chordwise taper ratio of deleted weight distribution surface, $(z_{\Delta C\ IB})/(z_{LE\ IB})$
18	–	–	$\lambda_{\Delta WT\ \emptyset B}$, $(z_{\Delta C\ \emptyset B})/(z_{LE\ \emptyset B})$
19-36	–	–	–
37	–	–	$CG_{Y\ DEV}$, spanwise centroid of device weight, fraction of device span
38	–	–	–
39	–	–	$\lambda_{Y\ DEV}$, spanwise taper ratio of device weight distribution line
40	–	–	Z_{IB}, weight ordinate at inboard station of device weight distribution line
41	–	–	$Z_{\emptyset B}$, weight ordinate or outboard station
42	–	–	$CG_{X\ DEV}$, chordwise centroid of device weight, fraction of average device chord
43	–	–	$\lambda_{X\ DEV}$, chordwise taper ratio of device weight distribution line
44-50	–	–	–
51	1	$(W/S)_{LE}$, input unit weight	TYPE, device type code
52	2	K_{wt}	Number of panels
53	3	λ_{wt}	Y_{IB}
54	4	K_1	$Y_{\emptyset B}$
55	5	C_1	$C_{TE\ IB}$
56	6	C_2	$C_{TE\ \emptyset B}$
57	7	C_3	$\Delta C_{fixed\ IB}$
58	8	K_2	$\Delta C_{fixed\ \emptyset B}$
59	9	C_4	$(W/S)_{DEV}$, input unit weight
60	10	$(t/c)_{ref}$	K_{wt}

TABLE 176. TGR ARRAY, SUBROUTINE LEWT (CONCL)

Array Location	Subarray TLED Location	Fixed Leading Edge Analysis	Leading Edge Control Surface Analysis
61	11	–	$K_{\Delta LE}$
62	12	–	λ wt
63	13	–	K_1
64	14	–	C_1
65	15	–	C_2
66	16	–	C_3
67	17	–	C_4
68	18	–	C_5
69	19	–	K_2
70	20	–	C_6
71	21	–	$(t/c)_{ref}$
72	22	–	K_3
73	23	–	K_4
74	24	–	C_7
75	25	–	N_{act}
76	–	–	$K_1 + K_3 + K_4$
77	–	–	$(Q \cdot S_{pnl})/b_{pnl}$
78	–	–	K_{DEV}, device weight index factor
79-100	–	–	–

TABLE 177. TST ARRAY, SUBROUTINE LEWT

General information for array TST:

Blank common reference location = T(1701)

Array size = 50 cells

Array TST is used for storage and retrieval of calculated leading edge control device geometry and weight distribution data. This array is used during computations for each of three devices analyzed by subroutine LEWT, array locations are initially set to 0.0 before each analysis.

Array Location	Description
1	Y_{IB}, inboard control station for device i
2	$Y_{ØB}$, outboard control station for device i
3	$X_{FWD\ IB}$, X-coordinate of true leading edge at Y_{IB}
4	$X_{FWD\ ØB}$, X-coordinate of true leading edge at $Y_{ØB}$
5	$X_{AFT\ IB}$, X-coordinate of device trailing edge at Y_{IB}
6	$X_{AFT\ ØB}$, X-coordinate of device trailing edge at $Y_{ØB}$
7	C_{IB}, device chord at Y_{IB}
8	$C_{ØB}$, device chord at $Y_{ØB}$
9	S, total projected plan from area for device i, sq ft/side
10	L_{AFT}, device span, distance along device trailing edge
11	Tan C, slope of device aerodynamic chord equation
12	C_C, center line intercept for device aerodynamic chord equation
13	L_{AFT}/N_{pnl}, panel lengths
14	S_1, inboard panel area, sq ft/side
15	S_2, middle panel area, sq ft/side
16	S_3, outboard panel area, sq ft/side
17	W_1, inboard panel weight, lb/side
18	W_2, middle panel weight, lb/side
19	W_3, outboard panel weight, lb/side
20	$(W/S)_1$, inboard panel unit weight, lb/sq ft
21	$(W/S)_2$, middle panel unit weight, lb/sq ft
22	$(W/S)_3$, outboard panel unit weight, lb/sq ft
23	Y_1, inboard station, panel 1
24	Y_2, outboard station, panel 1
25	Y_3, outboard station, panel 2
26	Y_4, outboard station, panel 3
27	C_1, device chord at Y_1
28	C_2, device chord at Y_2
29	C_3, device chord at Y_3
30	C_4, device chord at Y_4

TABLE 177. TST ARRAY, SUBROUTINE LEWT (CONCL)

Array Location	Description
31	CG_{Y1}, spanwise centroid, panel 1
32	CG_{Y2}, spanwise centroid, panel 2
33	CG_{Y3}, spanwise centroid, panel 3
34	CG_{X1}, chordwise centroid, panel 1
35	CG_{X2}, chordwise centroid, panel 2
36	CG_{X3}, chordwise centroid, panel 3
37	$\Delta Y_{1,2,3}$
38	λ_1, planform taper ratio, panel 1
39	λ_2, planform taper ratio, panel 2
40	λ_3, planform taper ratio, panel 3
41	CG_X, chordwise centroid, fraction of chord at Y_{CG}
42	λ_X, chordwise taper ratio of weight distribution surface
43	$X_{\Delta LE\ IB}$, chordwise station for fixed leading edge cutoff at Y_{IB} $C_{\Delta LE\ IB}$, chord for fixed leading edge deletion at Y_{IB}
44	$X_{\Delta LE\ \emptyset B}$, chordwise station for fixed leading edge cutoff at $Y_{\emptyset B}$ $C_{\Delta LE\ \emptyset B}$, chord for fixed leading edge deletion at $Y_{\emptyset B}$
45	Tan $C_{\Delta LE}$, slope of $C_{\Delta LE}$ equation
46	$C_{C\Delta LE}$, centerline intercept for $C_{\Delta LE}$ equation
47	$(N_{ZULT} \cdot DGW)/S_{surface}$
48	ΣW, total device weight, lb/side
49	ΣM_X, total moment about the X-axis, in.-lb
50	ΣM_Y, total moment about the Y-axis, in.-lb

TABLE 178. TTED ARRAY

General information for array TTED:

Blank common reference location = TGR(51)
Array size = 40
Array TTED is used for storage in retrieval of input variable data for analysis of fixed trailing edge and trailing edge devices. Subroutine TEWT initializes array locations to zero and transfers input data subarray DTE information to TTED for analysis of fixed TE structures. In the evaluation loop for TE devices, subroutine TEDEV organizes device variable data into array TTED in accordance to device type. Variable-data subarrays DTED1, DTED2, DSPDK, DFLPK, and DAILK are used to create required TTED data.
Array TTED is printed by subroutine TEWTI, as part of array TGR, under control of IP(11), case control card 1, column 11.

	Fixed TE Structure	Spoilers, Devices 1, 2	Flaps; Devices 3, 4, 5, 6; Types 0, 1, 2, 3	Ailerons; Elevators; Rudders; Device 6; Types 4, 5, 6
Array Location	Ref Data Array DTE	Ref Data Arrays DTED1, DSPDK	Ref Data Arrays DTED2, DFLPK	Ref Data Arrays DTED2, DAILK
1	$(W/S)_{TE}$	-	ID_{type}	ID_{type}
2	K_{wt}	N_{pnl}	N_{pnl}	N_{pnl}
3	λ_{wt}	Y_{IB}	Y_{IB}	Y_{IB}
4	K_1	$Y_{ØB}$	$Y_{ØB}$	$Y_{ØB}$
5	C_1	$C_{FWD\ IB}$	$C_{1\ IB}$	$C_{1\ IB}$
6	C_2	$C_{FWD\ ØB}$	$C_{1\ ØB}$	$C_{1\ ØB}$
7	C_3	$C_{AFT\ IB}$	$C_{2\ IB}$	$C_{2\ IB}$
8	C_4	$C_{AFT\ ØB}$	$C_{2\ ØB}$	$C_{2\ ØB}$
9	C_5	-	$C_{3\ IB}$	$C_{3\ IB}$
10	C_6	-	$C_{3\ ØB}$	$C_{3\ ØB}$
11	C_7	-	$C_{4\ IB}$	$C_{4\ IB}$

TABLE 178. TTED ARRAY (CONT)

Array Location	Fixed TE Structure	Spoilers, Devices 1, 2	Flaps; Devices 3, 4, 5, 6; Types 0, 1, 2, 3	Ailerons; Elevators; Rudders; Device 6; Types 4, 5, 6
	Ref Data Array DTE	Ref Data Arrays DTED1, DSPDK	Ref Data Arrays DTED2, DFLPK	Ref Data Arrays DTED2, DAILK
12	-	-	$C_{4\ \emptyset B}$	$C_{4\ \emptyset B}$
13	K_2	$ID_{\Delta TE}$	$C_{5\ IB}$	$C_{5\ IB}$
14	C_8	-	$C_{5\ \emptyset B}$	$C_{5\ \emptyset B}$
15	$(t/c)_{ref}$	-	$C_{TE\ UPR\ IB}$	$C_{TE\ UPR\ IB}$
16	-	-	$C_{TE\ UPR\ \emptyset B}$	$C_{TE\ UPR\ \emptyset B}$
17	-	-	$C_{TE\ LWR\ IB}$	$C_{TE\ LWR\ IB}$
18	-	-	$C_{TE\ LWR\ \emptyset B}$	$C_{TE\ LWR\ \emptyset B}$
19	-	(W/S)	(W/S)	(W/S)
20	-	K_{wt}	K_{wt}	K_{wt}
21	-	λ_{wt}	λ_{wt}	λ_{wt}
22	-	K_1	C_1	K_1
23	-	C_1	C_2	C_1
24	-	C_2	C_3	C_2
25	-	C_3	C_4	C_3
26	-	-	K_1, type 0	C_4
27	-	-	K_1, type 1	C_5 (ailerons only)
28	-	-	K_1, type 2	-
29	-	-	K_1, type 3	-

TABLE 178. TTED ARRAY (CONCL)

Array Location	Fixed TE Structure Ref Data Array DTE	Spoilers Devices 1, 2 Ref Data Arrays DTED1, DSPDK	Flaps; Devices 3, 4, 5, 6; Types 0, 1, 2, 3 Ref Data Arrays DTED2, DFLPK	Ailerons; Elevators; Rudders; Device 6; Types 4, 5, 6 Ref Data Arrays DTED2, DAILK
30	-	K_2	K_2	K_2
31	-	C_4	C_5	C_6
32	-	$(t/c)_{ref}$	$(t/c)_{ref}$	$(t/c)_{ref}$
33	-	K_3	K_3	K_3
34	-	K_4	K_4	K_4
35	-	C_5	C_6	C_7
36	-	N_{act}	N_{act}	N_{act}
37	-	$K_{(-\Lambda TE)}$	$K_{(-\Lambda TE)}$	$K_{(-\Lambda TE)}$
38	-	$K_{(+\Lambda TE)}$	$K_{(+\Lambda TE)}$	$K_{(+\Lambda TE)}$
39	-	-	-	-
40	-	-	-	-

TABLE 179. TST ARRAY, SUBROUTINES TEWTI AND TEDEV

General information for array LEWT:

Blank common reference location = T(1701)

Array size = 50 cells

Array TST is used for storage and retrieval of calculated trailing edge control device geometry and weight distribution data. This array is used during computations for each of six devices analyzed by subroutine TEWTI and TEDEV. Array locations are initially set to 0.0 by TEWTI before analysis of each device. The contents of this array are printed by TEWTI after each analysis under control of IP(11), case control card 1, column 11.

TE control devices are internally identified by code value of N and are sequentially evaluated. Code definitions are:

N	Device and Input Data Set Location
1	Spoiler No. 1, D(1580-1594)
2	Spoiler No. 2, D(1595-1609)
3	Flap No. 1, D(1610-1609)
4	Flap No. 2, D(1630-1649)
5	Flap No. 3, D(1650-1669)
6	Flap No. 4 or aileron for wing, D(1670-1689)
6	Elevator for horizontal tails, D(1690-1709)
6	Rudder for vertical tails, D(1710-1729)

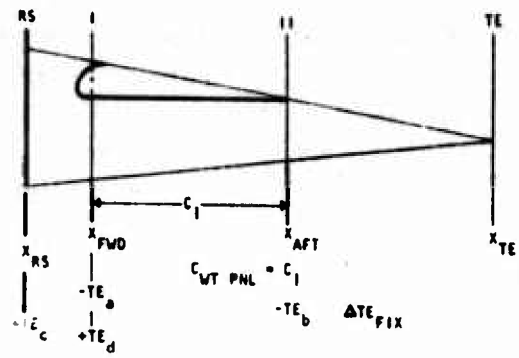
Device No. 6 is treated as a special type and processed in accordance to surface type being analyzed.

Devices No. 3, 4, 5, and 6 are evaluated based on type code specified in first item of device input data set. Type code definitions are:

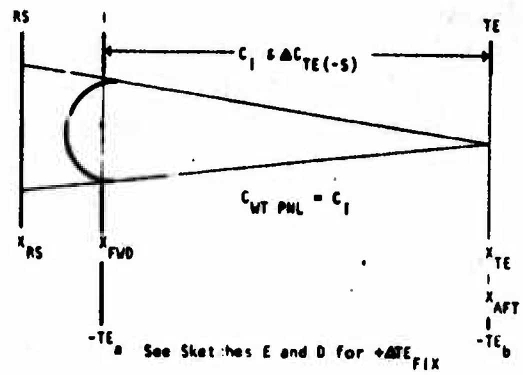
Code Value	Type
0	Simple flaps
1	Single-slotted flaps
2	Double-slotted flaps
3	Triple-slotted flaps
4	Ailerons
5	Elevators
6	Rudders

Information stored in array TST is created according to device number and type. The following cross-section sketches are presented to supplement data descriptions of array TST. Roman numeral points correspond to chordwise data points which must be specified in each input data set at inboard and outboard control stations Y_{IB} and $Y_{\emptyset B}$. (Refer to Tables 160 and 161, arrays DTED1 and DTED2.)

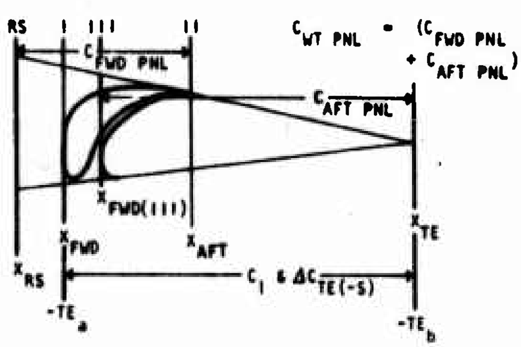
TABLE 179. TST ARRAY, SUBROUTINES TEWTI AND TEDEV (CONT)



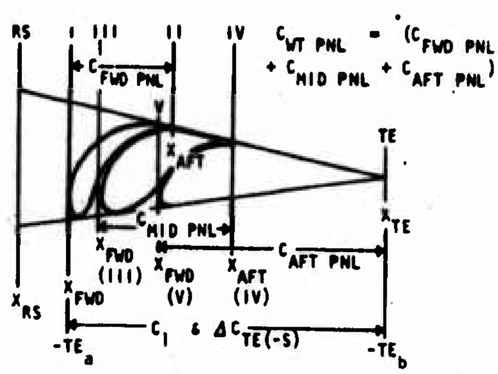
A. Device No. 1 and 2, Spoilers.



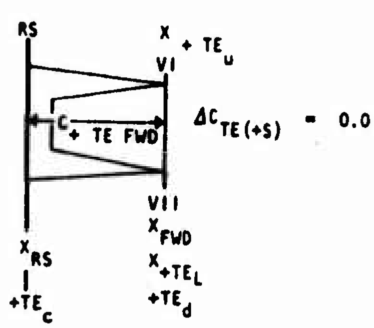
B. Device No. 3-6, Types 0, 1, 4, 5 and 6.



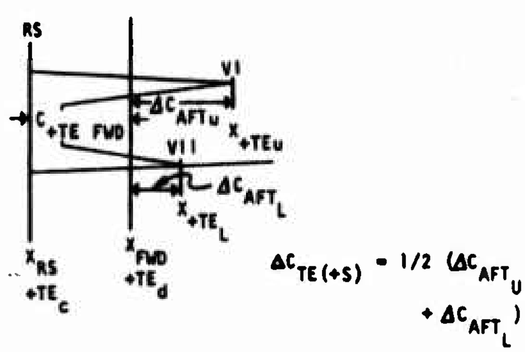
C. Device No. 3-6, Type 2.



D. Device No. 3-6, Type 3.



E. Fixed TE Without Shroud.



F. Fixed TE With Shroud.

TABLE 179. TST ARRAY, SUBROUTINES TEWTI AND TEDEV (CONT)

Array Location	Description	Sketch Ref A	Sketch Ref B,E,F	Sketch Ref C,E,F	Sketch Ref D,E,F
1	Y_{IB}, inboard control station	-	-	-	-
2	$Y_{ØB}$, outboard control station	-	-	-	-
3	$X_{FWD\ IB}$, forward X-control station at Y_{IB}. Also X-coordinate reference for $-TE_a$ and $+TE_d$.	I	I	I	I
4	$X_{FWD\ ØB}$	I	I	I	I
5	$X_{AFT\ IB}$, aft X-control station at Y_{IB}.	II	TE	II	II
6	$X_{AFT\ ØB}$	II	TE	II	II
7	$X_{RS\ IB}$, rear spar X-coordinate at Y_{IB}. Also X-coordinate reference for $+TE_c$.	RS	RS	RS	RS
8	$X_{RS\ ØB}$				
9	$X_{TE\ IB}$, X-coordinate of true trailing edge at Y_{IB}.	TE	TE	TE	TE
10	$X_{TE\ ØB}$	TE	TE	TE	TE
11	$X_{FWD(III)\ IB}$, X-control station for LE of second flap panel, double- and triple-slotted flaps.	-	-	III	III
12	$X_{FWD(III)ØB}$	-	-	III	III
13	$X_{AFT(IV)IB}$, X-control station for TE of second flap panel, triple-slotted flaps only.	-	-	-	IV
14	$X_{AFT(IV)ØB}$	-	-	-	IV
15	$X_{FWD(V)IB}$, X-control station for LE of aft flap panel, triple-slotted flaps only.	-	-	-	V
16	$X_{FWD(V)ØB}$	-	-	-	V
17	$X_{AFT(-TE)IB}$, X-control station for $-TE_b$.	II	TE	TE	TE

TABLE 179. TST ARRAY, SUBROUTINES TEWTI AND TEDEV (CONT)

Array Location	Description	Sketch Ref A	Sketch Ref B,E F	Sketch Ref C,E, F	Sketch Ref D,E, F
18	$X_{AFT(-TE)_{\emptyset B}}$	II	TE	TE	TE
19	$X_{+TE_U IB}$, X-control station for TE of upper surface of fixed trailing edge structure (upper shroud).	-	VI	VI	VI
20	$X_{+TE_U\ \emptyset B}$	-	VI	VI	VI
21	X_{+TE_L} IB, X-control station for TE of lower surface of fixed trailing edge structure (lower shroud).	-	VII	VII	VII
22	$X_{+TE_L\ \emptyset B}$	-	VII	VII	VII
23	$C_{1\ IB}$, device reference chord at Y_{IB}, $\left[X_{AFT(-TE)}-X_{FWD}\right]$, for fixed trailing edge deletion.	C_1	C_1	C_1	C_1
24	$C_{1\ \emptyset B}$	C_1	C_1	C_1	C_1
25	$C_{TE\ IB}$, true total trailing edge chord at Y_{IB}, $\left[X_{TE}-X_{RS}\right]$.	X	X	X	X
26	$C_{TE\ \emptyset B}$	X	X	X	X
27	$C_{WT\ pnl\ IB}$, reference device chord for weight equation at Y_{IB}. Also used for extended position planform area calculations for double- and triple-slotted flaps.	C_1	C_1	X	X
28	$C_{WT\ pnl\ \emptyset B}$	C_1	C_1	X	X
29	$C_{+TE\ FWD\ IB}$, forward reference chord for fixed TE structure at Y_{IB}, $\left[X_{FWD}-X_{RS}\right]$.	X	X	X	X
30	$C_{+TE\ FWD\ \emptyset B}$	X	X	X	X
31	Not used	-	-	-	-
32	Not used	-	-	-	-

TABLE 179. TST ARRAY, SUBROUTINES TEWTI AND TEDEV (CONT)

Array Location	Description	Sketch Ref A	Sketch Ref B,E F	Sketch Ref C,E F	Sketch Ref D,E, F
33	$\Delta C_{TE(-S)\ IB}$ reference chord for fixed trailing edge planform area adjustment at Y_{IB}, represents basic deleted portion of TE, set to C_1 for device No. 3, 4, 5, and 6.	0.0	C_1	C_1	C_1
34	$\Delta C_{TE(-S)\ \emptyset B}$	0.0	C_1	C_1	C_1
35	$\Delta C_{TE(+S)\ IB}$, reference chord for fixed trailing edge planform area adjustment at Y_{IB}, represents chord width for area to be added due to shroud structures. See sketches E and F.	0.0	X	X	X
36	$\Delta C_{TE(+S)\ \emptyset B}$	0.0	X	X	X
37	$Z_{-TE\ IB}$, spanwise weight per inch of fixed trailing edge structure to be replaced with control surface device at Y_{IB}.	X	X	X	X
38	$Z_{-TE\ \emptyset B}$	X	X	X	X
39	$X_{CG\ -TE\ IB}$, X-coordinate for chordwise centroid of Z_{-TE} above at Y_{IB}.	X	X	X	X
40	$X_{CG\ -TE\ \emptyset B}$	X	X	X	X
41	$Z_{+TE\ IB}$, spanwise weight per inch of trailing edge structure provisions for control devices at Y_{IB}, weight to be added to fixed trailing edge weights.	X	X	X	X
42	$Z_{+TE\ \emptyset B}$	X	X	X	X
43	$(Z_{+TE\ IB})(X_{CG\ +TE\ IB})$ first moment of trailing edge structure provision weight per inch at Y_{IB}.	X	X	X	X
44	$(Z_{+TE\ \emptyset B})(X_{CG\ +TE\ \emptyset B})$	X	X	X	X

TABLE 179. TST ARRAY, SUBROUTINES TEWTI AND TEDEV (CONCL)

Array Location	Description	Sketch Ref A	Sketch Ref B,E F	Sketch Ref C,E F	Sketch Ref D,E, F
45	$X_{AFT\ IB}$ supt, aft X-control station for device support weight distribution at Y_{IB} (forward X-control station assumed to be at X_{RS}).	I	X	X	X
46	$X_{AFT\ \emptyset B}$ supt	I	X	X	X
47	$z_{RS\ IB}$, weight per square inch of fixed trailing edge structure at (Y_{IB}, X_{RS}), based on basic fixed trailing edge weight per inch at Y_{IB}, $C_{TE\ IB}$ and $\lambda_{X\ cp}$.	X	X	X	X
48	$z_{RS\ IB}$				
49	Tan z_{IB}, slope of chordwise distribution line for basic fixed trailing edge, based on basic fixed trailing edge weight per inch at Y_{IB}, $C_{TE\ IB}$ and $\lambda_{X\ cp}$.	X	X	X	X
50	Tan $z_{\emptyset B}$	X	X	X	X

TABLE 180. TGR ARRAY, SUBROUTINES TEWT AND TEWTI

General information for array TGR:

Blank common reference location = T(1751)
Array size = 100 cells
Array TGR is used for storage and retrieval of data calculated during analysis of fixed trailing edge structures and trailing edge devices by subroutines TEWT and TEWTI. Array TGR is set to 0.0 by TEWT before analysis. Subroutine TEWTI sets TGR locations 1 through 50 to 0.0 before each analysis pass for the six TE devices. Array locations 51 through 90 are assigned to array TTED (Table 178).
Array TGR is printed by subroutine TEWTI at the end of each analysis pass under control of IP(11), case control card 1, column 11.

Array Location	Fixed Trailing Edge Analysis	Trailing Edge Control Surface Analysis
1	Z_{root}, basic fixed TE wt/in. at Y_1	W_{dev}, device weight. For flap-type devices, devices 3,4,5, and 6, this item is initially the panel plus support weight; subsequentially changed to panel structure weight from TGR(43)
2	Z_2	-
3	Z_3	-
4	Z_4	-
5	Z_5	W_{supts}, support structure weights for devices 3, 4, 5, 6
6	Z_6	W_{-TE}, fixed TE weight to be deleted and replaced with device weights
7	Z_7	W_{+TE}, incremental fixed TE weights to be added for device structural provisions. Initially equal to delta fixed TE, subsequently changed to include devices support weights for integration purposes only.
8	Z_8	ΔY, $(Y_{\emptyset B}-Y_{IB})$
9	Z_9	$\Delta Y/2.0$
10	Z_{10}	$(\Delta Y/2.0)/144.0$

TABLE 180. TGR ARRAY, SUBROUTINES TEWT AND TEWTI (CONT)

Array Location	Fixed Trailing Edge Analysis	Trailing Edge Control Surface Analysis
11	Z_{11}, basic fixed TE wt/in. at Y_{11}	ΔS_{-TE}, planform area to be deleted from fixed structure area due to device, sq ft/side
12	-	Y_{CG+TE} and $[(\Delta W_{+TE}) + (W_{supt} \cdot Y_{CG\ supt})]$
13	-	X_{CG+TE} and $[(\Delta W_{+TE} \cdot X_{CG+TE}) + (W_{supt} \cdot X_{CG\ supt})]$
14	-	$X_{CG+TE} = [\Sigma(Z_{+TE} \cdot X_{CG+TE})/\Sigma Z_{+TE}]$
15	-	$K_1 + K_{act} + K_3$
16	-	$K_{act} = f(K_4, N_{act}, C)$
17	-	$Q \cdot C_2$
18	-	L_{HL}, device span, length along device LE
19	-	L_{HL}/N_{pnl}
20	-	Tan C, slope of device aerodynamic chord equation (extended chords for flaps)
21	-	C_c, X-axis intercept for device aerodynamic chord equation (extended chords for flaps)
22	-	S_{pnl}, panel areas, sq ft/side, used in weight equation based on panel lengths, L_{HL}/N_{pnl} and extended position chords
23	-	S_{dev}, planform area for device, retracted position, sq ft/side
24	-	$S_{dev\ ext}$, planform area for device in extended position, sq ft/side
25	-	$\Delta X = (X_{AFT+TE} - X_{FWD+TE})$ at Y_{CG+TE}

TABLE 180. TGR ARRAY, SUBROUTINES TEWT AND TEWTI (CONT)

Array Location	Fixed Trailing Edge Analysis	Trailing Edge Control Surface Analysis
26	-	$W_{pnl} = (W/S)_{pnl} \cdot S_{pnl}$
27	-	$(W/S)_{pnl}$, calculated device panel unit weight, lb/sq ft
28	-	$Y_{IB\ pnl}$, inboard Y-coordinate for panel i
29	-	$Y_{ØB\ pnl}$, outboard Y-coordinate for panel i
30	-	$C_{IB\ pnl}$, inboard chord, panel i
31	-	$C_{ØB\ pnl}$, outboard chord, panel i
32	-	$\Sigma(W_{pnl} \cdot Y_{CG\ pnl})$
33	-	$\Sigma(W_{pnl} \cdot X_{CG\ pnl})$
34	-	-
35	-	$X_{FWD\ pnl}$ at $Y_{CG\ pnl}$
36	-	$X_{AFT\ pnl}$ at $Y_{CG\ pnl}$
37	-	$\Delta Y/N_{pnl}$
38	-	N_{pnl}
39	-	$Y_{CG\ pnl}$, Y-coordinate of panel weight centroid
40	-	$K_{wt} = K_1 + K_{act} + K_3 + K_{(t/c)}$
41	-	$K_{(t/c)} = f\ [K_2, C_{(t/c)}, (t/c)_{ref}, (t/c)_{pnl}]$
42	-	$X_{CG\ pnl}$, X-coordinate of panel weight centroid
43	-	$\Sigma W_{DEV\ pnl}$, total weight of device panel structures
44	-	$W_{supt} \cdot Y_{CG\ supt}$

TABLE 180. TGR ARRAY, SUBROUTINES TEWT AND TEWTI (CONCL)

Array Location	Fixed Trailing Edge Analysis	Trailing Edge Control Surface Analysis
45	-	$W_{supt} \cdot X_{CG\ supt}$
46	-	$X_{FWD\ +TE}$ at $Y_{CG\ +TE}$
47	-	$X_{AFT\ +TE}$ at $Y_{CG\ +TE}$
48	-	$Y_{CG\ +TE}$
49	-	X_{CG}
50	-	λX_{CG}
51-90	Array TTED	Array TTED (Table 178)
91-100	Not used	Not used

TABLE 181. TGR ARRAY, SUBROUTINE LETEI

General information for array TGR:

Blank common reference location = T(1751)
Array size = 100 cells
Array TGR is used by subroutine LETEI for storage and retrieval of strip data describing structural components of leading or trailing edges. Data are created for each integration strip from information stored in array CCI. Locations 94 through 99 are used after completion of integration procedure to compute weight scaling factors to correct results to initial estimated weight values.

Array Location	Description
1	Z_{FIX}, spanwise weight per inch of fixed structure at $Y_{CG\ strip}$.
2	Tan Z, slope of chordwise distribution line for Z_{FIX} preceding.
3	C_Z, Z-ordinate of chordwise distribution line for Z_{FIX} preceding at $X_{FWD\ strip\ CG}$.
4-9	$Z_{DEV\ (1-6)}$, spanwise weight per inch of each device at $Y_{CG\ strip}$.
10-15	Tan $Z_{DEV\ (1-6)}$, slope of chordwise distribution line for device weight per inch preceding.
16-21	$C_{Z\ DEV\ (1-6)}$, Z-ordinate for chordwise distribution line for device at $X_{FWD\ strip\ CG}$.
22-27	$X_{FWD\ DEV\ (1-6)\ strip\ CG}$, X-coordinate of device forward control line at $Y_{CG\ strip}$.
28-33	$X_{AFT\ DEV\ (1-6)\ strip\ CG}$, X-coordinate of device aft control line at $Y_{CG\ strip}$.

TABLE 181. TGR ARRAY, SUBROUTINE LETEI (CONT)

Array Location	Description
34-39	$Z_{(-struct)(1-6)}$, spanwise weight per inch at $Y_{CG\ strip}$ for fixed structure weights to be deleted and replaced with control surface device weights, computed as positive weight values.
40-45	Tan $Z_{(-struct)(1-6)}$
46-51	C_Z (-struct)(1-6)
52-57	X_{FWD} (-struct)(1-6)
58-63	X_{AFT} (-struct)(1-6)
64-69	$Z_{(+struct)(1-6)}$, spanwise weight per inch at $Y_{CG\ strip}$ for fixed structures to be added for control surface device provisions, TE only, computed as positive weight values.
70-75	Tan $Z_{(+struct)(1-6)}$
76-81	C_Z (+struct)(1-6)
82-87	X_{FWD} (+struct)(1-6)
88-93	X_{AFT} (+struct)(1-6)
94	ΔX_{strip}, $(X_{AFT\ strip\ CG} - X_{FWD\ strip\ CG})$
95	ΔX_{DEV}, $(X_{AFT\ DEV} - X_{FWD\ DEV})$
96	(ϵ Y/ ΔY) strip, scaling factor for device weight in strip, used to scale device weight down to account for condition where device Y-control stations, Y_{IB} or $Y_{ØB}$, is between strip Y_{IB} and $Y_{ØB}$.
97	$\Delta X_{(-struct)}$, $(X_{AFT}$ (-struct) $- X_{FWD}$ (-struct)
98	$\Delta X_{(+struct)}$, $(X_{AFT}$ (+struct) $- X_{FWD}$ (+struct)

TABLE 181. TGR ARRAY, SUBROUTINE LETEI (CONCL)

Array Location	Description
99	$(\epsilon X/\Delta X)$ grid, scaling factor for device, (-struct) and (+struct) weights, to account for conditions where the device forward or aft control points, X_{FWD} or X_{AFT}, fall between grid control points, X_{FWD} and X_{AFT}.
100	Not used.
Locations 94 through 99 are used after the 10 panel integration loops to store total integrated weights and integration scaling factors.	
94	$\Sigma W_{wt\ sys}$, sum of integrated panel weights for the weight analysis reference system.
95	$\Sigma W_{flutter\ opt\ sys}$, sum of integrated panel weights for the flutter optimization reference system.
96	$\Sigma W_{flexible\ loads\ sys}$, sum of integrated panel weights for the flexible loads analysis reference system.
97	$K_{wt\ sys}$, weight factor to correct weight analysis reference system mass distribution data to required weights.
98	$K_{flutter\ opt\ sys}$, weight factor to correct flutter optimization reference system mass distribution data to required weights.
99	$K_{flexible\ loads\ sys}$, weight factor to correct flexible loads analysis reference system mass distribution data to required weights.

TABLE 182. TST ARRAY, SUBROUTINE LETEI

General information for array TST:

Blank common reference location = T(1701)
Array size = 50 cells
Array TST is used by subroutine LETEI for storage and retrieval of detail geometry and weight distribution data during numerical integration of leading edge or trailing edge structures.

Array Location	Description
1	ΔY_{strip}
2	$Y_{IB\ strip}$
3	$Y_{\emptyset B\ strip}$
4	$Y_{CG\ strip}$
5	X_{FWD} strip CG
6	X_{AFT} strip CG
7	ΔX_{FWD} strip
8	ΔX_{AFT} strip
9	N_{strips} and $(Y_{CG\ strip}/\cos \Lambda_{EA})$
10	X_{EA} at $Y_{CG\ strip}$
11	$\Delta Y^2/12.0$
12	$\Delta X^2/12.0$
13	ΔY_{grid}, Y-distance from grid CG to flexible loads control station
14	ΔX_{grid}, X-distance from grid CG to flexible loads control station

TABLE 182. TST ARRAY, SUBROUTINE LETEI (CONT)

Array Location	Description
15	$Y_{\Lambda CG}$ grid
16	$X_{\Lambda CG}$ grid
17	M_{grids} and $\Delta Y_{\Lambda\ grid}$, Y_{Λ} distance from grid CG to weight or flutter optimization control station.
18	ΔX_{grid} at $Y_{CG\ strip}$
19	X_{FWD} grid
20	X_{AFT} grid
21	X_{CG} grid
22	$\Delta X_{grid\ CG\ to\ FWD}$, X-distance between grid CG and forward control line of strip at $Y_{CG\ strip}$.
23	A_{grid}, grid area.
24	ΣW_{grid}
25	$\Sigma I_{OY(A)}$, pitch inertia for grid, aerodynamic system
26	$\Sigma I_{OX(A)}$, roll inertia for grid, aerodynamic system.
27	$\Sigma I_{OY(S)}$, pitch inertia for grid, structural system.
28	$\Sigma I_{OX(S)}$, roll inertia for grid, structural system.
29	$\Sigma W_{grid} \bullet \Delta Y$ grid, first weight moment for grid, used for aerodynamic and structural system calculations.
30	$\Sigma W_{grid} \bullet \Delta X$ grid, first weight moment for grid, used for aerodynamic and structural system calculations.
31	W_{FIX} grid

TABLE 182. TST ARRAY, SUBROUTINE LETEI (CONCL)

Array Location	Description
31-37	$W_{DEV(1-6)}$ grid
38-43	$\Delta W_{(-struct)(1-6)\ grid}$, fixed structure weights to be deleted and replaced with control surface device weights, calculated as positive values, always subtracted from totals.
44-49	$\Delta W_{(+struct)(1-6)\ grid}$, fixed structure weights to be added for control surface device provisions, calculated as positive values, always added to totals.
50	Not used.

TABLE 183. TE ARRAY

General information for array TE:

Blank common reference location = CD(1251)

Array size = 150 cells

Array TE contains detail weight and geometry information for trailing edge devices 3, 4, 5, and 6, flap-type devices. Array data are created by subroutine TEWTI for use by WLETE during output print of trailing edge device summary data under control of IP(12) (case control card 1, column 12). Array locations are initialized to 0.0 values by WLETE before TEWTI analysis. Output dump of array TE is made by subroutine TEWT under control of IP(11) (case control card 1, column 11) after all trailing edge structures have been analyzed. Weights and planform areas are stored in terms of pounds and square feet per air vehicle values.

Array Location	Description
1-4	$S_{EXT\ 3\text{-}6}$, planform areas, extended position
5-8	$(W_{tot}/S_{EXT})_{(3\text{-}6)}$, unit weight for panels plus supports
9-12	$(W_{pnl}/S_{EXT})_{(3\text{-}6)}$, unit weight for panels
13-16	$(W_{supt}/S_{EXT})_{(3\text{-}6)}$, unit weight for supports
17-20	$W_{tot(3\text{-}6)}$, total device weights, panels plus supports
21-24	$(W_{tot}/S)_{(3\text{-}6)}$, unit weight for panels plus supports based on retracted position planform area
25-28	$Y_{CG\ tot(3\text{-}6)}$, Y-coordinate for panels plus supports CG, retracted position
29-32	$X_{CG\ tot(3\text{-}6)}$, X-coordinate for panels plus supports CG, retracted position
33-36	$Y_{CG\ tot(3\text{-}6)}$, YA-coordinate for preceding CG
37-40	$X_{CG\ tot\ (3\text{-}6)}$, XA-coordinate for preceding CG
41-44	$W_{supt\ (3\text{-}6)}$
45-48	$(W_{supt}/S)_{(3\text{-}6)}$, unit weight for supports based on retracted position planform area
49-52	$Y_{CG\ supt(3\text{-}6)}$
53-56	$X_{CG\ supt(3\text{-}6)}$
57-60	$Y_{ACG\ supt(3\text{-}6)}$
61-64	$X_{ACG\ supt(3\text{-}6)}$

TABLE 183. TE ARRAY (CONCL)

Array Location	Description
65	W_{tot_i}, total weight, lb/side
66-69	Y_{CG} pnl(3-6)
70-73	X_{CG} pnl(3-6)
74-77	Y_{ACG} pnl(3-6)
78-81	X_{ACG} pnl(3-6)
82-109	Values in TST(1) through TST(28), set up by WLETE after processing of TE data for print. Refer to TST ARRAY, WLETE, Table 184.
110-15C	Not used

TABLE 184. TST ARRAY, SUBROUTINE WLETE

General information for array TST:

Blank common reference location = T(1701)

Array size = 50 cells

Array TST contains leading edge and trailing edge summary data computed by subroutine WLETE and used for LE and TE data printed under control of IP(12) (case control card 1, column 12).

Locations 1 through 17 are used during processing of LE data. These are subsequently replaced with TE data, locations 1 through 29. Weights are stored as pounds per air vehicle values; planform areas are stored as square feet per air vehicle values.

Array Location	Description	
	Leading Edge Structure	Trailing Edge Structure
1	Y_{ACG}, total LE structure	Y_{ACG}, total TE structure
2	$Y_{ACG\ FIX}$, fixed LE structure	$Y_{ACG\ FIX}$, fixed TE structure
3	$Y_{ACG\ DEV\ 1}$, LE device 1	$Y_{ACG\ DEV\ 1}$, TE device 1, spoilers
4	$Y_{ACG\ DEV\ 2}$, LE device 2	$Y_{ACG\ DEV\ 2}$, TE device 2, spoilers
5	$Y_{ACG\ DEV\ 3}$, LE device 3	$Y_{ACG\ DEV\ 3}$, TE device 3, flaps
6	X_{ACG}, total LE structure	$Y_{ACG\ DEV\ 4}$, TE device 4, flaps
7	$X_{ACG\ FIX}$	$Y_{ACG\ DEV\ 5}$, TE device 5, flaps
8	$X_{ACG\ DEV\ 1}$	$Y_{ACG\ DEV\ 6}$, TE device 6, ailerons
9	$X_{ACG\ DEV\ 2}$	X_{ACG}, total TE structure
10	$X_{ACG\ DEV\ 3}$	$X_{ACG\ FIX}$
11	$W_{DEV\ 1}$, weight of LE device 1	$X_{ACG\ DEV\ 1}$
12	$W_{DEV\ 2}$, weight of LE device 2	$X_{ACG\ DEV\ 2}$
13	$W_{DEV\ 3}$, weight of LE device 3	$X_{ACG\ DEV\ 3}$
14	$S_{DEV\ 1}$, planform area of LE device 1	$X_{ACG\ DEV\ 4}$
15	$S_{DEV\ 2}$, planform area of LE device 2	$X_{ACG\ DEV\ 5}$
16	$S_{DEV\ 3}$, planform area of LE device 3	$X_{ACG\ DEV\ 6}$

TABLE 184. TST ARRAY, SUBROUTINE WLETE (CONCL)

Array Location	Description	
	Leading Edge Structure	Trailing Edge Structure
17	ΔX_i, X-distance from CG to EA line	$W_{DEV\ 1}$, weight of TE device 1
18	Not used	$W_{DEV\ 2}$, weight of TE device 2
19	Not used	$W_{DEV\ 3}$, weight of TE device 3
20	Not used	$W_{DEV\ 4}$, weight of TE device 4
21	Not used	$W_{DEV\ 5}$, weight of TE device 5
22	Not used	$W_{DEV\ 6}$, weight of TE device 6
23	Not used	$S_{DEV\ 1}$, planform area of TE device 1
24	Not used	$S_{DEV\ 2}$, planform area of TE device 2
25	Not used	$S_{DEV\ 3}$, planform area of TE device 3
26	Not used	$S_{DEV\ 4}$, planform area of TE device 4
27	Not used	$S_{DEV\ 5}$, planform area of TE device 5
28	Not used	$S_{DEV\ 6}$, planform area of TE device 6
29	Not used	ΔX_i, X-distance from CG to EA line
30-50	Not used	Not used

TABLE 185. CMII ARRAY

General information for array CMII:

Blank common reference location = CD(1251).

Array size = 150 cells.

Array CMII contains mass distribution data computed by overlay. (15,0) subroutines MISCNT, MISCIT, and CDL. The array information is created by MISCNT from results stored in array TCS. It is saved on mass storage file 1, record 153, by subroutine WDDATA. Subroutine WØDATA, overlay (17,0), resets the array in core from this source for computations of total surface weight distribution information and for output design data calculations by subroutines WFLDD and WVFDD. Subroutine WDDATA, overlay (16,0) creates array WTIP data from CMII locations 147 through 150. The array is initialized to 0.0 values by subroutine MISCNT. It is printed by WØDATA under control of IP(38), case control card 1, column 38.

Array CMII data summarizes the distribution characteristics of surface content items other than fuel, the surface tip structure and the concentrated masses that are to be treated as panel weight items during the computation for the three separate mass distribution data sets.

Array Location	Description
Locations 1 through 36 contain mass distribution data integrated in the weight analysis-reference system. Contents and tip structure weights only are used to create this data set. Mass data for 11 structural panels are stored in this set - the 10 panels defined by the 11 analysis control stations and the tip panel between station 11 and the surface tip station, b/2, if station 11 is specified inboard of b/2. Masses that are located inboard of the structural chord defined by station 1 are not considered; the total weight of these masses is stored in TGR(24) of subroutine MISCIT.	
1	0.0 not required.
2-12	$\Sigma W_{pnl(1-11)}$, sum of masses in the 11 weight analysis panels
13	0.0 not required.
14-24	$\Sigma(W \cdot \Delta Y_\Lambda)$ pnl(1-11), sum of spanwise moments for masses in the foregoing 11 weight panels, computed at inboard control station $Y_{\Lambda i}$, of each panel.
25	0.0, not required.

TABLE 185. CMII ARRAY (CONT)

Array Location	Description
25-36	$\Sigma(W \cdot \Delta X_\Lambda)_{pnl(1-11)}$, sum of chordwise moment for masses in the foregoing 11 weight panels; computed at inboard control station, $X_{\Lambda i} = 0.0$, of each panel.
Locations 37 through 91 contain mass distribution data integrated in the flutter optimization reference system. This data set contains data for 11 structural strip panels defined by $Y'_{\Lambda(1-12)}$, (TG(45)-TG(56), for the 11 structural analysis control stations $Y_{\Lambda(1-11)}$, (TG(1)-TG(11)). Distributed items consists of contents, tip structure, and concentrated masses 1 and 2 if item 12 in the input data sets for these masses is specified as a 0.0 value. If this situation exists, the total specified weight for masses 1 and 2 are used. If the code is specified as a positive non-zero value, masses 1 and 2 are not processed.	
37-47	$\Sigma W_{pnl(1-11)}$, sum of masses in the 11 flutter optimization panels.
45-58	$\Sigma(W \cdot \Delta Y_\Lambda)_{pnl(1-11)}$, sum of the spanwise moments for the 11 masses above, computed at the control stations, $Y_{\Lambda i}$, of each panel.
59-69	$\Sigma(W \cdot \Delta X_\Lambda)_{pnl(1-11)}$, sum of chordwise moments for the 11 masses above, computed at the control stations, $X_{\Lambda i} = 0.0$, of each panel.
70-80	$\Sigma(I_{Y\Lambda})_{pnl(1-11)}$, pitch inertia for the foregiven 11 masses, computed at the control station, $Y_{\Lambda i}$, of each panel, $\Sigma(I_{Y\Lambda})_i = \Sigma(W \cdot \Delta X_\Lambda^2)_i + \Sigma(I_{oY\Lambda})_i$.
81-91	$\Sigma(I_{X\Lambda})_{pnl(1-11)}$, roll inertia for the foregoing 11 masses, computed at the control station, $X_{\Lambda i} = 0.0$, of each panel, $\Sigma(I_{X\Lambda})_i = \Sigma(W \cdot \Delta Y_\Lambda^2)_i + (I_{oX\Lambda})_i$.
Locations 92 through 146 contain mass distribution data integrated in the flexible loads analysis reference system. This data set is sized to contain 11 aerodynamic strip panels; however, data for only 10 panels is computed. Panel boundaries are defined in TGA(1)-TGA(11). Integration control stations for each panel, $(Y,X)_i$, are defined in	

TABLE 185. CMII ARRAY (CONCL)

Array Location	Description
TGA(23)-TGA(42). Distributed items consists of contents, tip structure, and concentrated masses 1-7. Masses 1 and 2 are treated as store stations; the expended weights at these stations for the flexible loads design condition are deleted as required by input specifications in D(274) and D(275) (Input data variables DFXC(1) and DFXC(2)). Distribution data for the amount deleted at these stations are computed and saved in array CIØY for the total surface mass distribution calculations in overlay (17,0). (See Table 175.)	
92-101	$\Sigma W_{pnl(1-10)}$, sum of masses in the 10 flexible loads analysis panels.
102	0.0, not required.
103-112	$(W \cdot \Delta Y)_{pnl(1-10)}$, sum of spanwise moments for the foregoing 10 masses, computed as control stations, Y_i, of each panel.
113	0.0, not required.
114-123	$(W \cdot \Delta X)_{pnl(1-10)}$, sum of chordwise moments for the foregoing, 10 masses, computed as control stations, X_i, of each panel.
124	0.0, not required.
125-134	$\Sigma(I_Y)_{pnl(1-10)}$, pitch inertia for the foregoing 10 masses, computed as control station, Y_i, of each panel, $\Sigma(I_Y)_i = \Sigma(W \cdot \Delta X^2)_i + \Sigma(I_{oY})_i$.
135	0.0, not required.
136-145	$\Sigma(I_X)_{pnl(1-10)}$, roll inertia for the foregoing 10 masses, computed at control station, X_i, of each panel, $\Sigma(I_X)_i = \Sigma(W \cdot \Delta Y^2)_i + \Sigma(I_{oX})_i$.
146	0.0, not required.
Locations 147 through 150 contain total weights of the four mass items processed by subroutines MISCNT and MISCIT.	
147	W_{tip}, tip structure, from CCI(91), lb/side.
148	W_{unif}, weight of uniformly distributed weights, from TCS(248), specified in input data location D(1820), lb/side.
149	W_{line}, weight of control items distributed along spanwise lines, from CCI(31)-CCI(34), specified in input data locations D(1821) and D(1829), lb/side.
150	W_{conc}, weight of control items treated as concentrated masses, from CCI(1)-CCI(6), specified in input data locations D(1837), D(1840), D(1843), D(1846), D(1849) and D(1852), lb/side.

TABLE 186. CCDLI ARRAY, OVERLAYS (15,0), (16,0), AND (17,0)

General information for array CCDLI:

Blank common reference location = CD(501)

Array size = 150 cells

Array CCDLI is used for storage of data primarily associated with concentrated mass items. The information is created by subroutine WCØNT, overlay (15,0), from data computed by subroutines CDL, FDIS, and MISCNT for use in overlays (16,0) and (17,0). CCDLI is saved on mass storage file 1, record 154, by subroutine WCØNT. In overlay (17,0), subroutine WØDATA initializes array CCDLI from this source for retrieval of required data. WØDATA prints the contents of CCDLI as stored on record 154 under control of IP(38), case control card 1, column 38.

If the data generation option for output of design data for the flutter optimization program is selected, CCDLI information stored in locations 1 through 48 is necessary for processing of add-mass data. Array locations 92 through 150 is used by WVFDD for storage and retrieval of processed add-mass and other design information. This version of array CCDLI is printed by WVFDD under control of IP(34), case control card 1, column 34.

The following descriptions are presented in two parts. The first set defines the contents of CCDLI as created by WCØNT. The second set defines the data created and used by WVFDD.

Array Location	Description

Locations 1 through 91 contain detail information for each of seven concentrated mass items evaluated by subroutine CDL. This data set is created by WCØNT from array TC5, locations 144 through 234. Design data for the seven concentrated masses are specified in locations 1855 through 1938, consisting of 12 items for each mass. This set is identified as array DCDL1.

Array Location	Description
1	W_{CDL1}, weight of concentrated mass No. 1, lb/side.

TABLE 186. CCDLI ARRAY, OVERLAYS (15,0), (16,0), AND (17,0) (CONT)

Array Location	Description
2	Y_{ACDL1}, Y_Λ-coordinate of location of concentrated mass item 1, (Y_{CDL1}/COS $_{EA}$).
3	ΔX_{CDL1}, chordwise distance between mass centroid and structural reference line, (Y_{EA}-Y_{CG}).
4	ΔZ_{CDL1}, vertical distance between mass centroid and wing reference plane Z-coordinate at structural reference line, (Z_{EA}-Z_{CG}).
5	$I_{OY\ CDL1}$, pitch inertial of concentrated mass No. 1 about mass CG, lb-in^2.
6	$I_{OX\ CDL1}$, roll inertia of concentrated mass No. 1 about mass CG, lb-in^2.
7	$I_{OZ\ CDL1}$, yaw inertia of concentrated mass No. 1 about mass CG, lb-in^2.
8	$Y_{CG\ CDL1}$, spanwise location of mass CG.
9	$Y_{CG\ CDL1}$, chordwise location of mass CG.
10	$Z_{CG\ CDL1}$, vertical location of mass CG.
11	$Y_{ACG\ CDL1}$, Y_Λ-coordinate of mass CG.
12	$X_{ACG\ CDL1}$, X_Λ-coordinate of mass CG.
13-24	Concentrated mass No. 1, 12 items as previously defined.
25-36	Concentrated mass No. 3, 12 items as previously defined.
37-48	Concentrated mass No. 4, 12 items as previously defined.
49-60	Concentrated mass No. 5, 12 items as previously defined.
61-72	Concentrated mass No. 6, 12 items as previously defined.
73-84	Concentrated mass No. 7, 12 items as previously defined.

Locations 85 through 91 contain control codes for internal data processing of concentrated masses. These code values identify the type of loads data processing and the mass distribution computations to be made for flexible loads and flutter optimization data. The code values are computed as the ratio of the input weight value to the absolute value of that weight (the input weight value can be (0.0), (-), or (+) to denote the type of internal processing to be made). A zero value indicates no mass data to be processed. A positive value indicates all required data be computed for loads, flexible loads, and flutter optimization. A negative value indicates special processing by subroutines CDL and WVFDD, as explained later. In all cases, the absolute value of the specified weight is used to compute structural provision weights and 1-g shears and moments due to the concentrated masses.

TABLE 186. CCDLI ARRAY, OVERLAYS (15,0), (16,0), AND (17,0) (CONT)

Array Location	Description
	• Weight Analysis for Inertia Loads: Three 1-g shears and moments data sets are created as output for inertia loads processing in overlays (16,0), (9,0), and (18,0); separate data sets for concentrated masses 1 and 2, and one set for the sum of masses 3 through 7. The code word value directs the processing of shears and moments of masses 3 through 7. A negative value directs CDL to transmit structural provision weights only for that mass; the shears and moments are not to be added to the output data set. However, load sets for 1 and 2 are always created; thus, the appropriate specification for mass status at the structural design point must be specified in the input data set - D array locations 167 through 174. The negative code values allow for computations of provision weights only (computed as a function of the total mass) without affecting the inertia loads. • Mass Distribution Analysis for Flexible Loads Design Data: Mass characteristics of the concentrated masses for flexible loads analysis are computed and processed with the distributed-weight information for the adjacent aerodynamic strips corresponding to the integration control stations that straddle the mass Y_{CG}. Concentrated masses 1 through 7 are not processed if their code value is negative. • Mass Distribution Analysis for Flutter Optimization Design Data: Mass distributions for flutter optimization output are not processed in subroutine CDL for masses with negative code values. For positive code values, masses 5, 6, and 7 are merged with distributed-weight strip data. Masses 3 and 4 are not distributed by CDL; the descriptive information in locations 25 through 48 are used by WVFDD. Processing of masses 1 and 2 is dependent on the value of item 12 of the input data set for these masses (variable data array D, locations 1866 and 1878). A 0.0 value directs CDL to process these masses into the strip data sets (similar to masses 5, 6, and 7). A code value of 1.0 directs CDL to bypass the processing operation. In overlay (17,0), the 1.0 code directs WVFDD to process the descriptive information for these masses in locations 1 through 24 with the data created for masses 3 and 4 during the generation of output information for the flutter optimization program.

TABLE 186. CCDLI ARRAY, OVERLAYS (15,0), (16,0), AND (17,0) (CONT)

Array Location	Description
85-91	$K_{CDL(1-7)}$, processing code for concentrated masses 1 through 7. (Refer to the preceding notes.)
Locations 92 through 139 contain structural provision data for the seven concentrated masses. This data set is created by WCØNT from results of subroutine FDIS computations stored in array CCI. Item 8 of each parameter in this set is provided for future computations of T-tail provisions.	
92-98	$\Delta W_{CDL(1-7)}$, structural fitting and provision weights for the specified concentrated masses (addition to computed torque-box weight), lb/side.
99	$\Delta W_{T\text{-}tail}$, structural weights for T-tail provisions, tip station for vertical tail, root station for horizontal tails, lb/side.
100-107	$Y_{CG(1-8)}$, Y-coordinate, centroid of the foregoing masses.
108-115	$X_{CG(1-8)}$, X-coordinate, centroid of the foregoing masses.
116-123	$Y_{\Lambda CG(1-8)}$, Y_Λ-coordinate for the foregoing (Y_{CG}, X_{CG}).
124-131	$X_{\Lambda CG(1-8)}$, X_Λ-coordinate for the foregoing (Y_{CG}, X_{CG}).
132-139	$(\Delta W \cdot KD^2)_{1-8}$, weight ($I_o$) term for local airfoil depth effect of each item, lb-in^2.
Locations 140 through 150 contain surface tip data. This data set is created by WCØNT from results of subroutine MISCNT calculations stored in array CCI.	
104	W_{TIP}, tip structure weight, lb/side.
141	S_{TIP}, tip planform surface area, sq ft/side.
142	$(W/S)_{TIP}$, unit weight of tip structural, lb/sq ft.
143	$Y_{CG\ TIP}$, Y-coordinate, centroid of tip structure.
144	$X_{CG\ TIP}$, X-coordinate, centroid of tip structure.
145	$Y_{\Lambda CG\ TIP}$, Y_Λ-coordinate for the foregoing $(Y_{CG}, X_{CG})_{TIP}$.
146	$X_{\Lambda CG\ TIP}$, Y_Λ-coordinate for the foregoing $(Y_{CG}, X_{CG})_{TIP}$.

TABLE 186. CCDLI ARRAY, OVERLAYS (15,0), (16,0), AND (17,0) (CONT)

Array Location	Description
147	$(I_Y)_{TIP}$, pitch inertia of tip structure abort centroid, Y-axis.
148	$(I_X)_{TIP}$, roll inertia of tip structure abort centroid x-axis.
149	$(I_{Y'})_{TIP}$, pitch inertia, structural reference system.
150	$(I_{X'})_{TIP}$, roll inertia, structural reference system.

The following descriptions for CCDLI array locations are for data items used and/or created by subroutine WVFDD, overlay (17,0). Data for concentrated masses 1, 2, 3, and 4 originally stored in locations 1 through 9 are used by WVFDD for creation of output data describing "add-masses". Masses 1 and 3, and 2 and 4, are combined in accordance with input specifications, and the resulting data set stored in locations 1 through 24 in the same form as previously described.

1-91	Same as defined previously. (Refer to the preceding notes.)
92-102	EI_{1-11}, structural box bending stiffness, EI, stored root to tip.
103-113	GJ_{1-11}, structural box torsional stiffness, GJ, stored root to tip.
114	E, torque-box material reference modulus of elasticity for metallic design, psi.
115	G, torque box material reference modulus of rigidity for metallic design, psi.
116	ρ_{TB}, torque-box material reference density, lb/cu in.
117	ρ_{air}, density of air at flutter optimization design point, lb/cu in.
118	V_r, required flutter speed, knots.
119	W_{TF}, vehicle weight less surface plus contents, lb/side
120	ΔX_{CG}, X-distance from centroid of W_{TF} to root station, positive if CG is aft of root station, in.
121	I_{YY}, pitch inertia for W_{TF}, lb·in^2.
122	$b_1/2$, Y-coordinate for root station.
123	I_{XX}, roll inertia for W_{TF}, lb-in^2.
124	$Y_{\Lambda\,mass\ 1}$, structural station for "add-mass" 1, derived from processed data in locations 1 through 12.
125	$Y_{EA\ mass\ 1}$, Y-coordinate for "add-mass" 1.
126	$EI_{\ mass\ 1}$, torque box bending stiffness at $Y_{\Lambda mass\ 1}$, interpolated value.
127	$GJ_{\Lambda mass\ 1}$, torque box torsional stiffness at $Y_{\Lambda mass\ 1}$, interpolated value.

TABLE 186. CCDLI ARRAY, OVERLAYS (15,0), (16,0), AND (17,0) (CONCL)

Array Location	Description
128	1, 1 element of "add-mass" (3 x 3) matrix, lb.
129	2, 1 element of "add-mass" matrix, in.-lb.
130	3, 1 element of "add-mass" matrix, in.-lb.
131	1, 2 element of "add-mass" matrix, in.-lb.
132	2, 2 element of "add-mass" matrix, lb-in.^{2}
133	3, 2 element of "add-mass" matrix lb-in.^{2}
134	1, 3 element of "add-mass" matrix, in.-lb.
135	2, 3 element of "add-mass" matrix, lb-in.^{2}
136	3, 3 element of "add-mass" matrix, lb-in.^{2}
137-149	Data for "add-mass" 2, derived from processed data in locations 13 through 24. Items as previously defined for "add-mass" 1.
150	$ID_{mass\ 1}$, internal code to indicate status of "add-mass" 1 during processing of "add-mass" 2 data, indicates whether "add-mass" 1 exists. 0.0 = no "add-mass" 1, 1.0 = "add-mass" 1 has been processed.

TABLE 187. CFL1I AND CFL2I ARRAYS

General information for arrays CFL1I and CFL2I:

Blank common reference locations: CFL1I = CD(951)
CFL2I = CD(1101)

Array sizes = 150 cells

Arrays CFL1I and CFL2I contain mass distribution data for fuel cells 1 and 2 created by subroutine FDIS, overlay (15,0), from computed data stored in array TCS, the output array for subroutine TBFWI1. CFL1I and CFL2I are saved on mass storage file 1, records 151 and 152, by subroutine WCØNT. The arrays are recreated from this source by subroutine WØDATA in overlay (17,0) for final processing of surface mass distribution data. WØDATA prints the contents of these arrays under control of IP(38), case control card 1, column 38.

CFL1I and CFL2I contains the same information as defined for CTBI, the torque-box mass distribution array. Refer to Table 194 for detail definitions of locations 1 through 146. Subroutine FDIS creates data for locations 1 through 146 from TCS(1)-TCS(146). Since the array locations are not set to 0.0 values, locations 147, 148, 149, and 150 will contain data existing in the blank common locations from overlay (8,0) conputations. Currently, these locations for CFL1I will contain 0.0 values, and CFL2I locations will contain values found in overlay (8,0) array TD, locations 147 through 150. Records 151 and 152 are always created by FDIS, and will contain 0.0 values in locations 1 through 146 when input data for fuel cells are not specified.

Array Location	Description
1	0.0, not required
2-11	$\Sigma W_{pnl(1-10)}$, weight analysis reference system
12-13	0.0, not required
14-23	$\Sigma(W \cdot \Delta Y_\Lambda)_{pnl(1-10)}$
24-25	0.0, not required
26-35	$\Sigma(W \cdot \Delta X_\Lambda)_{pnl(1-10)}$
36	0.0, not required
27-47	$\Sigma(W_{pnl(1-11)}$, flutter optimization reference system
48-58	$\Sigma(W \cdot \Delta Y_\Lambda)_{pnl(1-11)}$
59-69	$\Sigma(W \cdot \Delta X_\Lambda)_{pnl(1-11)}$

TABLE 187. CFL1I AND CFL2I ARRAYS (CONCL)

Array Location	Description
70-80	$\Sigma(I_{YA})_{pnl}$ (1-11)
81-91	$\Sigma(I_{XA})_{pnl}$ (1-11)
92-101	ΣW_{pnl} (1-10), flexible loads analysis reference system
102	0.0, not required
103-112	$\Sigma(W \cdot \Delta Y)_{pnl}$ (1-10)
113	0.0 not required
114-123	$\Sigma(W \cdot \Delta X)_{pnl}$ (1-10)
124	0.0, not required
125-134	$\Sigma(I_Y)_{pnl}$ (1-10)
135	0.0, not required
136-145	$\Sigma(I_X)_{pnl}$ (1-10)
146	0.0, not required
147-150	Not required (refer to notes)

TABLE 188. CKD ARRAY, OVERLAY (15,0)

General information for array CKD:

Blank common reference location = CD(1951).

Array size = 50 cells

Array CKD is used for storage and retrieval of local airfoil depth data and for storage of yaw inertia values computed by overlay (15,0) subroutines MISCNT, MISCIT, and CDL. Array CKD locations are initialized to 0.0 values by MISCNT before any CKD variables are computed in overlay (15,0).

Array Location	Description
	Locations 1 through 19 contain data computed and used by subroutine MISCIT. Data in locations 1 through 10 are used in the inertia computations for the uniformly distributed mass item. Locations 11 and 12 are used during inertia computations for distribution line items.
1	$(D_{TB})_i$, torque-box average depth at integration control station $Y_{\Lambda i}$ for flutter optimization strip panels ($Y_{\Lambda i}$ value stored in TGR(28)).
2	$(D_{TB})'_i$, interpolated value of average torque-box depth at outboard $Y'_{\Lambda i}$ control station for current flutter optimization structural strip. The $Y'_{\Lambda i}$-coordinates are panel boundary coordinates, $Y'_{\Lambda}(2\text{-}12)$, stored in TG(46)-TG(56), for panel index values (1-11).
3	$(D_{TB})_{i-1}$, torque-box average depth value for integration control station $Y_{\Lambda i-1}$, stored in TGR(30).
4	$(D_{TB})_{IB}$, torque-box average depth at inboard control station for flexible loads aerodynamic panels, defined by the $(Y_{IB})_i$ value stored in TGR(32).
5	$(D_{TB})_i$, interpolated value of average torque-box depth at current flexible loads panel integration control station, Y_i, stored in TGR(33).
6	$(D_{TB})_{\emptyset B}$, torque-box average depth at outboard control station for flexible loads aerodynamic panel, defined by $(Y_{O/B})_i$ value stored in TGR(34).

TABLE 188. CKD ARRAY, OVERLAY (15,0) (CONT)

Array Location	Description
7	D_{ave}, average depth value computed for two torque-box subpanels defined by Y-coordinates in TGR(32), TGR(33) and TGR(34) for current flexible loads panel. $D_{ave} = 0.5\ [(D_{TB})_{IB} + (D_{TB})_i]$ or $0.5\ [(D_{TB})_i + (D_{TB})_{ØB}]$. These depth values used to compute the following Z-dimension term of the general mass inertia equation
8	$W_{sub-pnl}\ K\ D_{ave}^2$, Z-dimension term for mass inertia, where K = 1/12·(assumed vertical distribution factor), lb-in.^{2}. (NOTE: K is specified in DKDIN(6), input data array location D(1975).)
9	D_{ave}, average depth for the two torque-box subpanels defined by Y -coordinates in TGR(28), TGR(29) and TGR(30) for current flutter optimization panel, $D_{are} = 0.5\ [(D_{TB})_i + (D_{TB})'_i]$ or $0.5\ [(D_{TB})'_i + (D_{TB})_{i-1}]$.
10	$W_{sub-pnl} \cdot K \cdot D_{ave}^2$, Z-dimension term for mass inertia, same as the foregoing.
11	D_i, torque-box depth for distribution lines, computed from depth variation parameters stored in CCI(128)-CCI(151).
12	$W_{line} \cdot KD_i^2$, Z-dimension term for inertia, same as the foregoing except K specified in DKDIN(7), D(1976).
13-19	Not used.

Locations 20 through 5[illegible] contain yaw inertia data (I_Z), computed in the flexible loads analysis reference system. The tip structure (I_Z), location 20, is computed by MISCNT and used by MISCIT. Subroutine MISCIT computes data in locations 21-30. The concentrated mass (I_Z) are computed by subroutine CDL for masses 1-7. The total weights specified for masses 1 and 2 are used in these calculations. The yaw inertia values in locations 21-40 is transferred into array CIØY by computing subroutines for later use in overlay (17,0).

Array Location	Description
20	$(I_Z)_{TIP}$, yaw inertia of tip structure, compute at the tip centroid, lb-in.^{2}.

TABLE 188. CKD ARRAY, OVERLAY (15,0) (CONCL)

Array Location	Description
21-30	$(I_Z)_{MISC\ pnl(1-10)}$, yaw inertia for content items evaluated by MISCIT, computed at flexible loads integration control stations, lb-in.^{2}. (NOTE: Tip structure (I_Z) is included in panel 10 of this set.)
31-40	$(I_Z)_{CDL\ pnl(1-10)}$, yaw inertia for the seven concentrated masses, computed at flexible loads integration control stations for each panel, lb-in.^{2}. Masses located between two control stations are distributed to these stations based on values of "simple beam" reactions at stations for mass.
41-50	Not used.

TABLE 189. TVMT ARRAY

General information for array TVMT:

Blank common reference location = CD(51)

Array size = 250 cells

Array TVMT is used to transmit 1-g loads information computed by subroutines CDL and FDIS, overlay (15,0), to overlay (16,0) for processing by subroutine WDDATA. Array data consists of shears and moments for concentrated mass items and internal fuel, plus the pertinent information for each of the 7 concentrated masses. WDDATA uses TVMT to create inertia loads array data stored in the T(201-T(900) region for use by overlays (9,0) and (10,0) or (18,0).

Subroutine MISCNT, overlay (15,0), first initializes array TVMT to 0.0 values. After execution of subroutine CDL, MISCNT transfers the results of CDL calculations stored in arrays CCI and TCS to the proper TVMT locations. MISCNT then prints the contents of TVMT under control of IP(14), case control card 1, column 14. Subroutine FDIS subsequently transfers computed shears and moments for fuel cells 1 and 2 into TVMT from array TCS. FDIS then prints the final contents of TVMT under control of IP(17), case control card 1, column 17.

Array Location	Description
	Locations 1 through 66 contain 1-g load data sets for fuel cells 1 and 2 computed by subroutine FDIS. The fuel cell data set will contain 0.0 values if fuel cell design information is not specified in the input data for the surface. The load values are for full-capacity plus fuel system/ weights for the cell.
1-11	$V_{\Lambda FL1}(1\text{-}11)$, 1-g shears for fuel cell 1 as the 11 structural analysis control stations.
12-22	$M_{X\Lambda FL1}(1\text{-}11)$, 1-g bending moments for fuel cell 1 shears above.
23-33	$M_{Y\Lambda FL1}(1\text{-}11)$, 1-g torsional moments for fuel cell 1 shears above.
34-44	$V_{\Lambda FL2}(1\text{-}11)$, 1-g shears for fuel cell 2.
45-55	$M_{X\Lambda FL2}(1\text{-}11)$, 1-g bending moments for fuel cell 2 shears above.
56-66	$M_{Y\Lambda FL2}(1\text{-}11)$, 1-g torsional moments for fuel cell 2 shears above.

TABLE 189. TVMT ARRAY (CONT)

<table>
<tr><th>Array Location</th><th>Description</th></tr>
<tr><td colspan="2">Locations 67 through 165 contain 1-g load data sets for concentrated masses 1-7 computed and stored in CCI(202)-CC1(300) by subroutine CDL. Sets 1 and 2 are for the input weight values specified for masses 1 and 2. Set 3 contains the total 1-g loads due to masses 3-7.</td></tr>
<tr><td>67-77</td><td>$V_{\Lambda CDL1}(1-11)$, 1-g shear for concentrated mass 1</td></tr>
<tr><td>78-88</td><td>$M_{X\Lambda CDL1}(1-11)$, 1-g bending moment for concentrated mass 1</td></tr>
<tr><td>89-99</td><td>$M_{Y\Lambda CDL1}(1-11)$, 1-g torsional moment for concentrated mass 1</td></tr>
<tr><td>100-110</td><td>$V_{\Lambda CDL2}(1-11)$</td></tr>
<tr><td>111-121</td><td>$M_{X\Lambda CDL2}(1-11)$</td></tr>
<tr><td>122-132</td><td>$M_{Y\Lambda CDL2}(1-11)$</td></tr>
<tr><td>133-143</td><td>$V_{\Lambda CDL3-7}(1-11)$</td></tr>
<tr><td>144-154</td><td>$M_{X\Lambda CDL3-7}(1-11)$</td></tr>
<tr><td>155-165</td><td>$M_{Y\Lambda CDL3-7}(1-11)$</td></tr>
<tr><td colspan="2">Locations 166 through 249 contain the detail information computed for each of the seven concentrated mass items evaluated by subroutine CDL. This data set is created from array TCS, locations 144 through 227. This set is identical to the variables stored in array CCDLI, location 1 through 84 (Table 186).</td></tr>
<tr><td>166</td><td>W_{CDL1}, weight of concentrated mass No. 1</td></tr>
<tr><td>167</td><td>$Y_{\Lambda CDL1}$</td></tr>
<tr><td>168</td><td>ΔX_{CDL1}</td></tr>
<tr><td>169</td><td>ΔZ_{CDL1}</td></tr>
<tr><td>170</td><td>$I_{OY\ CDL1}$</td></tr>
<tr><td>171</td><td>$I_{OX\ CDL1}$</td></tr>
<tr><td>172</td><td>$I_{OZ\ CDL1}$</td></tr>
<tr><td>173</td><td>$Y_{CG\ CDL1}$</td></tr>
<tr><td>174</td><td>$X_{CG\ CDL1}$</td></tr>
<tr><td>175</td><td>$Z_{CG\ CDL1}$</td></tr>
<tr><td>176</td><td>$Y_{ACG\ CDL1}$</td></tr>
<tr><td>177</td><td>$X_{ACG\ CDL1}$</td></tr>
</table>

TABLE 189. TVMT ARRAY (CONCL)

Array Location	Description
178-189	Concentrated mass No. 2, 12 items as defined for No. 1
190-201	Concentrated mass No. 3, 12 items as defined for No. 1
202-213	Concentrated mass No. 4, 12 items as defined for No. 1
214-225	Concentrated mass No. 5, 12 items as defined for No. 1
226-237	Concentrated mass No. 6, 12 items as defined for No. 1
238-249	Concentrated mass No. 7, 12 items as defined for No. 1
250	Not used

TABLE 190. T ARRAY, LOCATIONS 201-900

General information for array T:
- Blank common reference location = 1
- Array size = 2,060 cells
- Locations 201 through 900 contain design data computed and/or used by the structural synthesis/weight analysis routines of overlays (9,0), (10,0), and (18,0). Initial values for some of the variables are created by overlay (16,0) routines.
- This region of the T array containing initial design values created by overlay (16,0) computations is printed by subroutine WDDATA before execution of overlay (9,0) for metallic design or overlay (18,0) for advanced composite design, under control of IP(23), case control card 1, column 23.

T Array Location	Variable Name	Description
(201-219)	(DMTLB(1-11))	Torque-box material properties, metallic design. Required for proper program operation when analyzing advanced composite designs, specify any available metallic material from data bank.
201	DMTLB(1)	Design temperature for torque-box material set.
202	DMTLB(2)	Variable SDMU, μ, Poissons' ratio.
203	DMTLB(3)	A_c equation constant for compression stress-strain curve.
204	DMTLB(4)	B_c, equation constant for compression stress-strain curve.
205	DMTLB(5)	E_c, compression modulus of elasticity.
206	DMTLB(6)	Variable SDFY. F_{cy}, compression yield stress.
207	DMTLB(7)	A_t, equation constant for tension stress-strain curve.
208	DMTLB(8)	B_t, equation constant for tension stress-strain curve.
209	DMTLB(9)	E_t, tension modulus of elasticity.
210	DMTLB(10)	Variable SDTY. F_{ty}, tension yield stress.
211	DMTLB(11)	ρ, material density.
212	DMTLB(12)	Variable SDTU. F_{tu}, tension ultimate stress.
213	DMTLB(13)	Variable SDFY. F_{cp}, proportional limit stress, compression.
214	DMTLB(14)	Variable ERT. E_c at room temperature.
215	DMTLB(15)	Variable GRT. G at room temperature.

TABLE 190. T ARRAY, LOCATIONS 201-900 (CONT)

T Array Location	Variable Name	Description
216	DMTLB(16)	Variable SDFSU. F_{su}, ultimate shear allowable stress.
217	DMTLB(17)	Variable SDBRU. F_{bru}, ultimate bearing allowable stress.
218	DMTLB(18)	$K_{Ftu(b1/2)}$, limit load tension allowable factor for fatigue, side of body.
219	DMTLB(19)	$K_{Ftu}(2)$, limit load tension allowable factor for fatigue, station 2.
220-229	DPCDL(1-10)	ΔW_{CDL} pnl(1-10), incremental torque-box panel weights for structural provision required for concentrated masses 1-7, lb/panel.
230-240	DCDLV(1-11)	$V_{\Lambda(1-11)(\Delta CDL)}$, 1-g shears due to the preceding ΔW_{COL}.
241-251	DCDLM(1-11)	$M_{X\Lambda(1-11)(\Delta CDL)}$, 1-g bending moments due to the preceding ΔW_{CDL}.
252-262	DCDLT(1-11)	$M_{Y\Lambda(1-11)(\Delta CDL)}$, 1-g torsional moments due to the preceding ΔW_{CDL}.
263-273	WPILE(1-11)	Wt/in.(1-11)(LE), total leading edge structure weight/inch.
274-284	WPITE(1-11)	Wt/in.(1-11)(TE), total trailing edge structure weight/inch.
285-296	WPLLE(1-12)	$\Sigma W_{pnl(0-11)(LE)}$, panel weights for total leading edge structures.
297-308	WPLTE(1-12)	$\Sigma W_{pnl(0-11)(TE)}$, panel weights for total trailing edge structures.
309-319	CDLV1(1-11)	$V_{\Lambda(1-11)(CDL1)}$, 1-g shears due to concentrated mass No. 1, values for total weight at mass station.
320-330	CDLM1(1-11)	$M_{X\Lambda(1-11)(CDL1)}$, 1-g bending moments for concentrated mass No. 1.
331-341	CDLT1(1-11)	$M_{X\Lambda(1-11)(CDL1)}$, 1-g torsional moments for concentrated mass No. 1.
342-352	CDLV2(1-11)	$V_{\Lambda(1-11)(CDL2)}$, 1-g shears due to concentrated mass No. 2, values for total weight at mass station.
353-363	CDLM2(1-11)	$M_{X\Lambda(1-11)(CDL2)}$, 1-g bending moments for concentrated mass No. 2.
364-374	CDLT2(1-11)	$M_{Y\Lambda(1-11)(CDL2)}$, 1-g torsional moments for concentrated mass No. 2.

TABLE 190. T ARRAY, LOCATIONS 201-900 (CONT)

T Array Location	Variable Name	Description
375-385	CDLV3(1-11)	V_{Λ}(1-11)(CDL3-7), 1-g shears due to concentrated masses 3-7.
386-396	CDLM3(1-11)	$M_{X\Lambda}$(1-11)(CDL3-7), 1-g bending moments for concentrated masses 3-7.
397-407	CDLT3(1-11)	$M_{Y\Lambda}$(1-11)(CDL3-7), 1-g torsional moments for concentrated masses 3-7.
408-418	FLM2(1-11)	$M_{X\Lambda}$(1-11)(FL2), 1-g bending moments for total contents of fuel cell 2.
419-429	FLT2(1-11)	$M_{Y\Lambda}$(1-11)(FL2), 1-g torsional moments for total contents of fuel cell 2.
(430-444)	(TDGW(1-15))	Definitions follow.
430	TDGW(1)	Variable DGWRI. $\{[K_V(DWG)_i/(DGW)_o] - 1.0\}$.
431	TDGW(2)	Variable DGWR. $[K_V(DGW)_i/(DGW)_o]$.
432	TDGW(3)	Variable DDWK. Factor for inertia loads. 0.0 if D(110) = 0.0, for vertical tails and if input loads are net loads. 1.0 if D(110) for wing and horizontal tails for calculated airloads and input gross airloads.
433	TDGW(4)	Variable TBXK. Value is set to 1.0 by ABDW and is not changed. Used by VLOAD and AVLØAD as factor applied to total inertia loads.
434	TDGW(5)	Not used.
435	TDGW(6)	Not used.
436	TDGW(7)	Not used.
437	TDGW(8)	V_{AL}, airload shear on surface. Used by ALØAD only if module calculates loads distributions, value of input or calculated airload, lb/side.
438	TDGW(9)	Spanwise center of pressure location for the preceding airload shear, fraction of airload distribution span.
439	TDGW(10)	Chordwise location of center of pressure for the preceding airload shear, fraction of chord.
440	TDGW(11)	Variable RFL1. Scaling factor for loads due to fuel cell 1 contents for current design weight.
441	TDGW(12)	Variable RFL2. Scaling factor for loads due to fuel cell 2 contents for current design weight.
442	TDGW(13)	Varaiable CDLK1. Scaling factor for loads due to retained masses at concentrated mass station 1 for current design weight.

TABLE 190. T ARRAY, LOCATIONS 201-900 (CONT)

T Array Location	Variable Name	Description
443	TDGW(14)	Variable CDLK2. Scaling factor for loads due to retained masses at concentrated mass station 2 for current design weight.
444	TDGW(15)	Variable CDLK3. Scaling factor for loads due to masses at concentrated mass stations 3-7, always 1.0.
445-455	FLV1(1-11)	$V_{A(1-11)(FL1)}$, 1-g shears for total contents of fuel cell 1.
456-466	FLM1(1-11)	$M_{XA(1-11)(FL1)}$, 1-g bending moments for total contents of fuel cell 1.
467-477	FLT1(1-11)	$M_{YA(1-11)(FL1)}$, 1-g torsional moments for total contents of fuel cell 1.
478-488	FLV2(1-11)	$V_{A(1-11)(FL2)}$, 1-g shears for total contents of fuel cell 2.
489-499	XBP(1-11)	$X_{(1-11)}$, X-coordinates for the 11 structural analysis control stations.
500-510	YBP(1-11)	$Y_{(1-11)}$, Y-coordinates for the 11 structural analysis control stations.
511-521	YST(1-11)	$Y_{A(1-11)}$, Y -coordinate for the 11 structural analysis control stations.
(522-529)	(RFDGW(1-8))	Definitions follow.
522	RFDGW(1)	$K_{FL1(DGWØ)}$, fuel cell 1 scale factor for content weight at DGWØ.
523	RFDGW(2)	$K_{FL1(DGW1)}$, fuel cell 1 scale factor for content weight at DGW(1).
524	RFDGW(3)	$K_{FL1(DGW2)}$, fuel cell 1 scale factor for content weight at DGW(2).
525	RFDGW(4)	$K_{FL1(DGW3)}$, fuel cell 1 scale factor for content weight at DGW(3).
526	RFDGW(5)	$K_{FL2(DGW0)}$, fuel cell 2 scale factor for content weight at DGWØ.
527	RFDGW(6)	$K_{FL2(DGW1)}$, fuel cell 2 scale factor for content weight at DGW(1).
528	RFDGW(7)	$K_{FL2(DGW2)}$, fuel cell 2 scale factor for content weight at DGW(2).
529	RFDGW(8)	$K_{FL2(DGW3)}$, fuel cell 2 scale factor for content weight at DGW(3).

TABLE 190. T ARRAY, LOCATIONS 201-900 (CONT)

T Array Location	Variable Name	Description
530-540	TBD(1-11)	D_{ave} (1-11), average torque-box depths.
541	---	Not used.
542-552	TBW(1-11)	$W_{TB(1-11)}$, torque-box widths.
553	---	Not used.
554-564	ALPV(1-11)	$V_{\Lambda(1-11)(+AL)}$, limit shears for airloads, up-bending condition.
565-575	ALPM(1-11)	$M_{X\Lambda(1-11)(+AL)}$, limit bending moments for air-loads, up-bending condition
576-586	ALNV(1-11)	$V_{\Lambda(1-11)(-AL)}$, limit shears for airloads, down-bending condition.
587-597	ALNM(1-11)	$M_{X\Lambda(1-11)(-AL)}$, limit bending moments for air-loads, down-bending condition.
598-608	DWV(1-11)	$V_{\Lambda(1-11)(TB)}$, 1-g shears for torque-box structures.
609-619	DWM(1-11)	$M_{X\Lambda(1-11)(TB)}$, 1-g bending moments for torque-box structures.
620-630	DWT(1-11)	$M_{Y\Lambda(1-11)(TB)}$, 1-g torsional moments for torque-box structures.
(631-640)	(TFLD(1-10))	Fuel cell data, definitions follow.
631	TFLD(1)	$K_{DES(FL1)}$, scaling factor for fuel cell 1 at DGWØ.
632	TFLD(2)	$K_{DES(FL2)}$, scaling factor for fuel cell 2 at DGWØ.
633	TFLD(3)	$W_{DES(FL1)}$, design fuel in cell 1 at DGWØ, lb/side.
634	TFLD(4)	$W_{DES(FL2)}$, design fuel in cell 2 at DGWØ, lb/side.
635	TFLD(5)	$W_{total(FL1)}$, total contents for fuel cell 1, fuel plus fuel-systems, lb/side.
636	TFLD(6)	$W_{total(FL2)}$, total contents for fuel cell 2, fuel plus fuel-systems, lb/side.
637	TFLD(7)	$W_{cap(FL1)}$, full-capacity fuel weight in fuel cell 1, lb/side.
638	TFLD(8)	$W_{cap(FL2)}$, full-capacity fuel weight for fuel cell 2, lb/side.
639	TFLD(9)	$W_{FS(FL1)}$, fuel-systems weight in fuel cell 1, lb/side.

TABLE 190. T ARRAY, LOCATIONS 201-900 (CONT)

T Array Location	Variable Name	Description
640	TFLD(10)	$W_{FS(FL2)}$, fuel-systems weight in fuel cell 2, lb/side.
(641-644)	(WTIP(1-4))	Definitions follow.
641	WTIP(1)	W_{TIP}, tip structure weight, lb/side.
642	WTIP(2)	W_{unif}, weight of uniformly distributed content items, lb/side.
643	WTIP(3)	W_{line}, weight of line distribution content items, lb/side.
644	WTIP(4)	W_{conc}, weight of content items treated as concentrated masses, lb/side.
645-654	WPNLS(1-10)	$W_{TB(1-10)}$, panel weights for distributed torque-box structures, strength design only, lb/side.
655	---	Not used.
656-665	TPNLW(1-10)	$W_{tot\ TB(1-10)}$, panel weights for total torque-box plus secondary structures, lb/side.
(666-667)	(DTTRB(1-2))	Definitions follow.
666	DTTRB(1)	$\Delta W_{T\text{-tail root}}$, weight increment for T-tail provisions at root chord station (horizontal tail), lb/side. For future use only, currently not computed.
667	DTTRB(2)	$\Delta W_{T\text{-tail tip}}$, weight increment for T-tail provisions at tip chord station (vertical tail), lb/side. For future use only, currently not computed.
668-678	GJRQD(1-11)	$GJ_{VF(1-11)}$, required stiffness to prevent surface flutter, lb-in.^{2}.
668-678	GJRTT(1-11)	Same as the preceding.
679-689	YBUD(1-11)	$\bar{Y}_{upr(1-11)}$, load centroid for upper cover, distance from outer mold line.
690-700	YBLD(1-11)	$\bar{Y}_{lwr(1-11)}$, load centroid for lower cover, distance from outer mold line.
701-711	DWMII(1-11)	$(M_{X\Lambda})_{DW(1-11)}$, 1-g bending moment for torque-box structures, previous deadweight or grossweight pass.

TABLE 190. T ARRAY, LOCATIONS 201-900 (CONT)

T Array Location	Variable Name	Description
712-722	DBMI1(1-11)	$(M_{XA})_{ult+NZ(1-11)}$, up-bending design bending moment for previous deadweight or grossweight pass.
723-733	DNXI1(1-11)	$N_{X(1-11)}$, upper cover design compression load, previous deadweight or grossweight pass, lb/in.
(734-744)	(SWT(1-11))	Weight data to be transferred to CTBW array, refer to Table 193. Created by TBØPT, overlay (9,0), or ATBØPT, overlay (18,0).
734	SWT(1)	Σ WSURFACE, lb/air vehicle
735	SWT(2)	$\Sigma W_{ØPNL}$, lb/air vehicle.
736	SWT(3)	$\Sigma W_{PIVØT}$, lb/air vehicle.
737	SWT(4)	ΣW_{C-SEC}, lb/air vehicle.
738	SWT(5)	ΣW_{TB}, lb/air vehicle.
739	SWT(6)	ΣW_{LE}, lb/air vehicle.
740	SWT(7)	ΣW_{TE}, lb/air vehicle.
741	STW(8)	ΣW_{MISC}, lb/air vehicle.
742	SWT(9)	W_{TIP}, lb/air vehicle.
743	SWT(10)	$\Sigma W_{\Delta T\text{-}tail}$, lb/air vehicle. NOTE: This item not calculated.
744	SWT(11)	$\Sigma \Delta W_{VF}$, lb/air vehicle.
745-755	TBWPI(1-11)	$Z_{TB(1-11)}$, weight per inch of torque-box structures, strength design only, lb/in.
756-766	VFWPI(1-11)	$Z_{\Delta VF(1-11)}$, weight per inch of torque-box structure increment required to satisfy flutter, lb/in.
767-777	TDWPI(1-11)	$\Delta Z_{TB(1-11)}$, weight-per-inch increment of structure weights for inertia loads calculation for next deadweight or grossweight pass, lb/in.
778-788	TMWPI(1-11)	$Z_{MISC(1-11)}$, weight per inch of secondary structures, lb/in.
789-799	TBCWT(1-11)	$W_{\Delta CONC(1-11)}$, incremental chordwise torque-box structure weights at structural analysis control stations, lb/side. Weight of bulkhead and splice provision increments over and above estimated weights per inch of distributed items.

TABLE 190. T ARRAY, LOCATIONS 201-900 (CONCL)

T Array Location	Variable Name	Description
800-810	DEFFI(1-11)	$D_{eff(1-11)}$, effective couple-arm of torque-box, value used to compute current loads. Set up by WTCAL, overlay (10,0) or (18,0), used to compute load change effects during inertia loads estimation for next deadweight or gross-weight pass.
811-821	STMV(1-11)	$\Sigma V_{\Lambda(1-11)(MISC)}$, total 1-g shears for leading edge, trailing edge, contents other than fuel and concentrated items 3-7.
822-832	STMM(1-11)	$\Sigma M_{X\Lambda(1-11)(MISC)}$, 1-g bending moments for the preceding shear load.
833-843	STMT(1-11)	$\Sigma M_{Y\Lambda(1-11)(MISC)}$, 1-g torsional moments for the preceding shear load.
844-854	SDWV(1-11)	$\Sigma V_{\Lambda(1-11)(DW)}$, total 1-g shears for outer panel less torque-box weights, constant for all deadweight passes.
855-865	SDWM(1-11)	$\Sigma M_{X\Lambda(1-n)(DW)}$, 1-g bending moments for the preceding shears.
866-876	SDWT(1-11)	$\Sigma M_{Y\Lambda(1-11)(DW)}$, 1-g torsional moments for the preceding shears.
877-887	ALPT(1-11)	$M_{Y\Lambda(1-11)(+AL)}$, limit torsional moments for air-loads, up-bending condition.
888-898	ALNT(1-11)	$M_{Y\Lambda(1-11)(-AL)}$, limit torsional moments for air-loads, down-bending condition.
899	---	Not used.
900	---	Not used; however, used by subroutine PIVØT, overlays (9,0) and (18,0).

TABLE 191. SUBROUTINE REFERENCES FOR T(201)-T(900) VARIABLES

The variables names listed herein are for the data items stored in the array T created and/or used by overlays (9,0), (10,0), (16,0), (17,0), and (18,0). These variables are some of the design information necessary for the synthesis of both metallic and advanced composite torque boxes. They are also used in the weight analysis of the structures and for data processing of computed data for output print.
Definitions for these variables can be found in Table 190.

Variable Name	Size	Reference Location	References		
			Overlay	Defined	Used
ALNM	11	T(587)	16	ALØAD	ALØAD,VLØAD1
			9	---	VLØAD
			18	---	ACLØAD,AVLØAD
ALNT	11	T(888)	16	ALØAD	ALØAD,VLØAD1
			9	---	VLØAD
			18	---	ACLØAD,AVLØAD
ALNV	11	T(576)	16	ALØAD	ALØAD,VLØAD1
			9	---	VLØAD
			18	---	ACLØAD,AVLØAD
ALPM	11	T(565)	16	ALØAD	ALØAD,VLØAD1
			9	---	VLØAD
			18	---	ACLØAD,AVLØAD
ALPT	11	T(877)	16	ALØAD	ALØAD,VLØAD1
			9	---	VLØAD
			18	---	ACLØAD,AVLØAD
ALPV	11	T(554)	16	ALØAD	ALØAD,VLØAD
			9	---	VLØAD
			18	---	ACLØAD,AVLØAD
CDLK1	1	TDGW(13)	16	ABDW	ABDW
			9	PRØG	PRØG
			18	ACPRØG	ACPRØG
CDLK2	1	TDGW(14)	16	ABDW	ABDW
			9	PRØG	PRØG
			18	ACPRØG	ACPRØG
CDLK3	1	TDGW(15)	16	ABDW	ABDW
			9	PRØG	PRØG
			18	ACPRØG	ACPRØG,AVLØAD

TABLE 191. SUBROUTINE REFERENCES FOR T(201)-T(900) VARIABLES (CONT)

Variable Name	Size	Reference Location	References		
			Overlay	Defined	Used
CDLM1	11	T(320)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG, AVLØAD
CDLM2	11	T(353)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
CDLM3	11	T(386)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
CDLT1	11	T(331)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
CDLT2	11	T(364)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
CDLT3	11	T(397)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
CDLV1	11	T(309)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
CDLV2	11	T(342)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
CDLV3	11	T(375)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
DBMII	11	T(712)	16	YBSET	YBSET
			9	PRØG,DWYBA	PRØG,DWYBA
			18	ACPRØG,DWYBA	DWYBA
DCDLM	11	T(241)	16	WDDATA	---
			9	---	DEADW
			18	---	DEADW
DCDLT	11	T(230)	16	WDDATA	---
			9	---	DEADW
			18	---	DEADW

TABLE 191. SUBROUTINE REFERENCES FOR T(201)-T(900) VARIABLES (CONT)

Variable Name	Size	Reference Location	References		
			Overlay	Defined	Used
DCDLV	11	T(220)	16	WDDATA	---
			9	---	DEADW
			18	---	DEADW
DDWK	1	TDGW(3)	16	ABDW	VLØAD1
			9	---	VLØAD
			18	---	AVLØAD
DEFFI	11	T(800)	16	YBSET	YBSET
			9	PRØG,DWYBA,TBØPT	PRØG,DWYBA
			10	WTCAL	CNSTR,WTCAL
			18	DWYBA	DWYBA,WTCAL
DGWR	1	TDGW(2)	16	ABDW	VLØAD1
			9	PRØG	PRØG,VLØAD
			18	ACPRØG	ACPRØG,AVLØAD
DGWRI	1	TDGW(1)	9	PRØG	DWYBA
			18	ACPRØG	DWYBA
DMTLB	19	T(201)	16	MTLCW	CNSTC,GJCAL
			10	---	STRIL
			18	---	ACPRØG
DNXII	11	T(723)	16	YBSET	YBSET
			9	PRØG,TBØPT	PRØG,DWYBA
			10	WTCAL	CNSTR,WTCAL
			18	WTCAL	DWYBA,WTCAL
DPCDL	10	T(220)	16	WDDATA	---
			9	---	PRØG
			10	---	WTCAL
			18	---	ACPRØG,WTCAL
DTTRB	2	T(666)	16	WDDATA	---
			10	---	CNSTR,WTCAL
			18	---	ATBØPT,WTCAL
DWM	11	T(609)	16	WDDATA	ABDW,YBSET,VLØAD1
			9	PRØG,DEADW	PRØG,DEADW,DWYBA, VLØAD
			18	DEADW	ACPRØG,DEADW,DWYBA, AVLØAD

TABLE 191. SUBROUTINE REFERENCES FOR T(201)-T(900) VARIABLES (CONT)

Variable Name	Size	Reference Location	References		
			Overlay	Defined	Used
DWMII	11	T(701)	16	YBSET	---
			9	PRØG	PRØG,DWYBA
			18	ACPRØG	DWYBA
DWT	11	T(620)	16	WDDATA	ABDW,VLØAD1
			9	DEADW	DEADW,VLØAD
			18	DEADW	DEADW,AVLØAD
DWV	11	T(598)	16	WDDATA	ABDW,VLØAD1
			9	DEADW	DEADW,VLØAD
			18	DEADW	DEADW,AVLØAD
ERT	1	DMTLB(14)	16	---	CNSTC
FLM1	11	T(456)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
FLM2	11	T(408)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
FLT1	11	T(467)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
FLT2	11	T(419)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
FLV1	11	T(445)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
FLV2	11	T(478)	16	WDDATA	ABDW
			9	---	PRØG
			18	---	ACPRØG,AVLØAD
GRT	1	DMTLB(15)	16	---	CNSTC,GJCAL
GJRQD	11	T(668)	16	GJCAL	GJCAL,VLØAD1
			9	---	VLØAD,PRTA
			10	---	EIGJC
			18	---	ASTIFF,AYLØAD,ACPRTA
GJRTT	11	T(668)	16	GJTT	GJTT

TABLE 191. SUBROUTINE REFERENCES FOR T(201)-T(900) VARIABLES (CONT)

Variable Name	Size	Reference Location	References		
			Overlay	Defined	Used
RFDGW	8	T(522)	16	ABDW	ABDW
			9	---	PRØG
			18	---	ACPRØG
RFL1	1	TDGW(11)	16	ABDW	ABDW
			9	PRØG	PRØG
			18	ACPRØG	ACPRØG
RFL2	1	TDGW(12)	16	ABDW	ABDW
			9	PRØG	PRØG
			18	ACPRØG	ACPRØG
SDBRU	1	DMTLB(17)	16	---	CNSTC
SDFP	1	DMTLB(13)	16	---	CNSTC
SDFSU	1	DMTLB(16)	16	---	CNSTC
SDFY	1	DMTLB(6)	16	---	CNSTC
SDMU	1	DMTLB(2)	16	---	CNSTC
			10	---	STRIL
SDTU	1	DMTLB(12)	16	---	CNSTC
SDTY	1	DMTLB(10)	16	---	CNSTC
SDWM	11	T(855)	16	ABDW	ABDW,VLØAD1
			9	PRØG	VLØAD
			18	ACPRØG	AVLØAD
SDWT	11	T(866)	16	ABDW	ABDW,VLØAD1
			9	PRØG	VLØAD
			18	ACPRØG	AVLØAD
SDWV	11	T(844)	16	ABDW	ABDW,VLØAD1
			9	PRØG	VLØAD
			18	ACPRØG	AVLØAD
STMM	11	T(822)	16	WDDATA	ABDW,VLØAD1
			9	---	VLØAD
			18	---	ACPRØG,AVLØAD
STMT	11	T(833)	16	WDDATA	ABDW,VLØAD1
			9	---	VLØAD
			18	---	ACPRØG,AVLØAD
STMV	11	T(811)	16	WDDATA	ABDW,VLØAD1
			9	---	VLØAD
			18	---	ACPRØG,AVLØAD

TABLE 191. SUBROUTINE REFERENCES FOR T(201)-T(900) VARIABLES (CONT)

Variable Name	Size	Reference Location	References		
			Overlay	Defined	Used
SWT	11	T(734)	9	TBØPT	PRØG
			18	---	ACPRØG,ATBØPT
TBCWT	11	T(789)	16	WDDATA	---
			9	PRØG,DWYBA,TBØPT	PRØG,DEADW,DWYBA
			10	WTCAL	CNSTR,WTCAL
			18	DWYBA,WTCAL	ACPRØG,DEADW,DWYBA, WTCAL
TBD	11	T(530)	16	WDDATA	WDDATA,YBSET
			9	---	DWYBA
			18	---	ACPRØG,DWYBA,ASTIFF
TBW	11	T(542)	16	WDDATA	WDDATA,YBSET
			10	---	TBØPT
			18	---	ACPRØG,ATBØPT,ASTIFF
TBWPI	11	T(745)	16	WDDATA	
			9	PRØG	PRØG,DEADW,DWYBA, TBØPT,PRTA
			10	WTCAL	CNSTR,WTCAL
			18	WTCAL	ACPRØG,DEADW,DWYBA, WTCAL,ACPRTA
TBXK	1	TDGW(4)	16	ABDW	VLØAD1
			9	---	VLØAD
			18	---	AVLØAD
TDGW	15	T(430)	16	ALØAD,ABDW	ALØAD,ABDW,VLØAD1
			9	PRØG	PRØG,DWYBA,VLØAD
			18	ACPRØG	ACPRØG,DWYBA,AVLØAD
TDWPI	11	T(767)	9	DWYBA	DWYBA,DEADW
			18	DWYBA	DWYBA,DEADW
TFLD	10	T(631)	16	WDDATA	ABDW
			18	---	ACLØAD
TMWPI	11	T(778)	9	PRØG,TBØPT	PRØG,DEADW
			10	WTCAL	CNSTR,WTCAL
			18	WTCAL	ACPRØG,DEADW,WTCAL
TPNLW	10	T(656)	16	WDDATA	---
			9	PRØG,TBØPT	PRØG,DEADW
			10	WTCAL	

TABLE 191. SUBROUTINE REFERENCES FOR T(201)-T(900) VARIABLES (CONCL)

Variable Name	Size	Reference Location	References		
			Overlay	Defined	Used
VFWPI	11	T(756)	9	PRØG,TBØPT	PRØG,DEADW,DWYBA
			10	WTCAL	CNSTR
			18	WTCAL	ACPRØG,DEADW,DWYBA
WPILE	11	T(263)	16	WDDATA	---
			10	---	WTPIN
			18	---	WTPIN
WPITE	11	T(274)	16	WDDATA	---
			10	---	WTPIN
			18	---	WTPIN
WPLLE	12	T(285)	16	WDDATA	---
			10	---	WTCAL
			18	---	WTCAL
WPLTE	12	T(297)	16	WDDATA	---
			10	---	WTCAL
			18	---	WTCAL
WPNLS	10	T(645)	16	WDDATA	WDDATA
			9	PRØG,TBØPT	PRØG,DEADW
			10	WTCAL	CNSTR,WTCAL
			18	WTCAL	ACPRØG,DEADW,WTCAL
WTIP	4	T(641)	16	WDDATA	---
			10	---	WTCAL
			18	---	WTCAL
			17	---	WØDATA
XBP	11	T(489)	16	WDDATA	---
YBLD	11	T(690)	16	YBSET	---
			9	PRØG,TBØPT	PRØG,DWYBA,PRTA
			10	SECTD	CNSTR,EIGJC
			18	ACNSTR	DWYBA,ACPRTA
YBP	11	T(500)	16	WDDATA	---
YBUD	11	T(679)	16	YBSET	---
			9	PRØG,TBØPT	PRØG,DWYBA,PRTA
			10	SECTD	CNSTR,EIGJC
			18	ACNSTR	DWYBA,ACPRTA
YST	11	T(511)	16	WDDATA	WDDATA
			18	---	ACWMS,ACWRBS

TABLE 192. TVF ARRAY

General information for array TVF:

Blank common reference location = T(1961)

Array size = 100

Array TVF contains surface flutter data, computed and used by subroutine GJCAL, for estimation of flutter design requirement of lifting surfaces. Geometry and flutter design point information from array TGJ stored on record 10, mass storage file 1, is used to create array TVF data necessary for the analysis by subroutines GJCAL and GJSI. GJCAL prints the contents of TVF for each structural station analyzed, under control of IP(22), control card 2, column 22. Array TVF is initially set to 0.0 values by GJCAL.

Array Location	Description
1	$(GJ_{reqd})_i$ computed value of required GJ at station $Y_{\Lambda i}$, calculated by subroutine GJSI during analysis for each analysis control station (Equation 14), lb-in.^{2}. This value is output when array TVF is printed under control of IP(22). Also, G_{des}, material shear modulus at the reference structure design temperature, created and used by subroutine GJCAL during final processing of required GJ values, psi.
2	K_{ee} term of Equation 14. Kq of this term modified and programmed as $K_{flex} \cdot 22.5 \cdot K_{sp}^2$, where K_{flex} = flexibility factor with a value of 1.10 (1.10 · 22.5 = 24.75). Default value of K_{flex}, location D(1441), is currently set to 1.0, but may be changed by the user. Value of K_{ee} is programmed as follows: $$K_j K_{sp}^2 \left[\frac{-1.116\ Q\ AR^2\ (22.5\ K_{flex})}{1480\ (0.8 + AR)^2}\right]$$ where K_d = GJ factor in location D(312) and K_{sp} = flutter speed margin of safety factor in location D(252).
3	K_{swp} term of Equation 14, $(b_s'/2)^2 \left[0.4 + 0.7 \cos(\Lambda_{EA} - 10.0°)\right]$ $(b_s'/2)$ is the effective exposed structural semispan for surface flutter analysis, the inboard control station assumed to be that indicated by the value in location D(246), unless superceded by a nonzero value in location D(343).

TABLE 192. TVF ARRAY (CONT)

Array Location	Description
4	K_{gi}, planform constant term for K_{geomi} term of Equation 14 (refer to Equation 14c), $(C_{RS}' \tau^2)$ $[3(1 - \lambda')]$.
5	Product of general constants of Equation 14 divided by material G at flutter design points $(K_{ee} \cdot K_{swp} \cdot K_{gi})/G$.
6	C_1 term of Equation 14, $(1 - \lambda')^3/\{[3(1-\lambda'\sigma')^3]\ [AC(1-\lambda'\sigma')(t/c)']\}$.
7	C_2 term of Equation 14, $(1)/[(1-\lambda')\ (RS-FS)_{\perp}]$.
8	C_3 term of Equation 14, $\{-\theta_T/(\theta_R-\theta_T)\}\ \{L_n(\lambda'\sigma')/\ AC(1-\lambda'\ \sigma')(t/c)'] + Ln(\lambda')/[(1-\lambda')\ (RS-FS)_{\perp}]\}$.
9	C_1V_1 term of Equation 14, calculated by GJS1.
10	C_2V_2 term of Equation 14, calculated by GJSI.
11	C_3V_3 term of Equation 14, calculated by GJSI.
12	$C_1V_1 + C_2V_2 + C_3V_3$, calculated by GJSI.
13	J_{ref}, reference value of J as derived from Equation 14, to be modified by computed local chord factor, K_{mac}, and G to derive required GJ value stored in location 1 for the current analysis station, calculated by GJSI.
14	Not used.
15	G, shear modulus of torque-box material, design temperature value at the critical clutter design point.
16	τ, rotational factor to convert aerodynamic chords to structural chords.
17	$b_s'/2$, exposed structural span for surface flutter analysis.
18	C_R', exposed aerodynamic root chord.
19	DR', average torque-box depth at the exposed root chord station.
20	$Y_{\Lambda i}'$, structural station location for current analysis points, distance from tip chord station.
21	C_i, aerodynamic chord at the Y-coordinate for $Y_{\Lambda i}$.
22	D_i, average torque-box depth at $Y_{\Lambda i}$.
23	W_i torque-box width at $Y_{\Lambda i}$.

TABLE 192. TVF ARRAY (CONT)

Array Location	Description
24	K_i, variable GJ factor to be applied to the final calculated value, factors that are specified in D(346)-D(356) when option of input factors is selected; if not, this factor will be the derived factor based on the current station location relative to the two control stations in locations 25 and 26 and the factors in locations 80 and 81. For the option of constant GJ values inboard of the station defined in location 25 and outboard of the station defined in location 26 (VFID, D(251), specified as -1.0), this factor is set to 1.0
25	$(Y'_\Lambda)_{IB}$, inboard control station for GJ factor calculation based on factors input in D(314) and D(316) or for constant GJ value option, distance from tip chord station along structural reference line.
26	$(Y'_{\Lambda\emptyset B})$, outboard control station for GJ factor specified in D(316) or station along structural reference line.
27	GJ_{IB}, required GJ at $(Y'_\Lambda)IB$, computed when constant GJ option is selected. This value used for all analysis stations inboard of $(Y'_\Lambda)_{IB}$. (Note: Flutter factor derived from values in D(314) and D(316) or input in D(346)-D(356) are not used to compute this value.
28	$GJ_{\emptyset B}$, required GJ at $(Y'_\Lambda)_{\emptyset B}$, computed when constant GJ option is selected. This value used for all analysis control stations outboard of $(Y'_\Lambda)_{\emptyset B}$. (Note: Flutter factor restriction as noted for GJ_{IB} apply.)
29	Not used.
30	CD_3, planform constant for term V_{1i} in Equation 14 (refer to Equation 14f), $[9(\lambda')^2(1-\sigma')^2]/[1-\lambda')2]$.
31	CD_2 planform constant for term V_{1j} in Equation 14 (refer to Equation 14f), $[3\lambda'(1-\sigma')/[2(1-\lambda')]$.
32	CD_1, 1.0 for programming purposes.
33	$\lambda'\sigma'$, planform constant for term V_{1i} in Equation 14 (refer to Equation 14f).
34	$(\lambda'\sigma')^2$ planform constant for term V_{1i} in Equation 14 (refer to Equation 14f).
35	$(\lambda'\sigma')^3$, planform constant for term V_{1i} in Equation 14 (refer to Equation 14f).

TABLE 192. TVF ARRAY (CONT)

Array Location	Description
36	$1/\lambda'$ or 1/0.00001 if $\lambda' = 0.0$.
37	$1/(\lambda'\sigma')$ or 1/0.00001 if $(\lambda'\sigma') = 0.0$.
38	$(\lambda')^3$
39	$(\lambda')^3/3.0$.
40	$(1-\lambda'\sigma')$, 0.00001 if value is computed as (-) or 0.0.
41	$(1-\lambda')$, 0.00001 if value is computed as (-) or 0.0.
42	$(1-\sigma')$
43	σ', exposed thickness ratio taper.
44	$(RS\text{-}FS)_i$, structural box width factor.
45	$(t/c)'$, thickness ratio as exposed root chord.
46	AC, arc centroid of torque-box sections.
47	λ', exposed planform taper ratio.
48	$(\lambda')^2$,
49	$(\lambda')^3$,
50	$D_i \cdot W_i$, calculated by GJSI.
51	$D_i + W_i$, calculated by GJSI.
52	C_i/C_R', calculated by GJSI.
53	D_i/D_R', calculated by GJSI.
54	$(C_i/C_R')^3$, calculated by GJSI.
55	$(D_i/D_R')^2$, calculated by GJSI.
56	$Ln[(c_i/C_R')(1/\lambda')]$, calculated by GJSI.
57	$Ln[(D_i/D_R')(1/\lambda'\sigma')]$, calculated by GJSI.
58	Variable for term $V1_i$ in Equation 14, calculated by GJSI and used in a loop. (D_i/D_R') for I=1, $(D_i/D_R')^2$ for I=2, $(D_i/D_R')^3$ for I=3.

TABLE 192. TVF ARRAY (CONT)

Array Location	Description
59	Variable for term V_{1_i} in Equation 14, calculated by GJSI and used in a loop. $(Ln\ (D_i/D_R'\ \lambda') - 1)$ for 1 = 1, $(2Ln\ (D_i/D_R'\ \lambda') -1)$ for 1=2, $(3\ Ln\ (D_i/D_R'\ \lambda') -1)$ for 1 = 3.
60	Variable for term V_{1_i} in Equation 14, $CD_3 \cdot \left\{(D_i/D_R')\ [Ln\ (D_i/D_R'\ \lambda') +1] + \sigma'\lambda'\right\}$, calculated by GJSI.
61	Variable for term V_{1_i} in Equation 14, $CD_2 \cdot \left\{(D_i/D_R')^2\ [2Ln\ (D_i/D_R'\ \lambda') -1] + (\sigma'\lambda')^2\right\}$, calculated by GJSI.
62	Variable for term V_{1_i} in Equation 14, $CD_1 \cdot \left\{(D_i/D_R')^3\ [3LN\ (D_i/D_R'\ \lambda') -1] + (\sigma'\lambda')^3\right\}$, calculated by GJSI.
63	V_{1_i} term of Equation 14, sum of values in location 60, 61 and 62, calculated by GJSI.
64	V_{2_i}, term of Equation 14, $\left\{(C_i/C_R')^3\ [Ln\ (C_i/C_R'\ \lambda') -0.333] + (\lambda')^3/3\right\}$, calculated by GJSI.
65	V_{3_i} term of Equation 14, $[(C_i/C_R')^3 - (\lambda')^3]$, calculated by GJSI.
66	AR, planform aspect ratio of exposed surface.
67	$(D_i\ W_i) / (D_i + W_i)$, calculated by GJSI.
68	Not used
69	Not used
70	Not used

TABLE 192. TVF ARRAY (CONT)

Array Location	Description
71	K_{MAC}, GJ factor for local chord effect computed by GJSI as a function of the ratio of local aerodynamic chord to exposed panel MAC.
72	Not used
73	Not used
74	C_{TIP}, tip chord.
75	C'_R , exposed root chord.
76	C'_{MAC}, MAC of exposed panel.
77	C_i/C'_{MAC}, calculated by GJSI.
78	Tan K_{GJ}, slope of GJ factor variation line.
79	C_K, tip station intercept for GJ factor variation line, for computations using Y'_Λ values measured from the tip chord station to the analysis station.
80	K_{IB}, GJ factor at the inboard control station, $(Y'_\Lambda)_{IB}$, value as specified in D(314).
81	$K_{\emptyset B}$, GJ factor at the outboard control station, $(Y'_\Lambda)_{\emptyset B}$, value as specified in D(315).
82	Not used
83	0.8 + AR
84	COS $(\Lambda_{EA}$ - 10.0°)
85	Planform constant for C_3 term in Equation 14, $\left\{Ln\ (\lambda'\sigma')/[AC\ (1-\lambda'\sigma')\ (t/c)']\right\}$
86	Planform constant for C_3 term in Equation 14, $\left\{Ln\ (\lambda')/[(1-\lambda')\ (RS - FS)_\perp]\right\}$

TABLE 192. TVF ARRAY (CONCL)

Array Location	Description
87	Planform constant for C_3 term in Equation 14, $\left[-\theta_T/(\theta_R-\theta_T)\right]$
88	$(1-\lambda'/(1-\lambda'\sigma')$
89	$3\lambda'(1-\sigma')/(1-\lambda')$
90	$(1-\lambda')(RS-FS)_\perp$
91	$AC\ (1-\lambda'\sigma')(t/c)'$
92	$AC\ (t/c)'$
93	$C_R'/(b_s'/2)$
94	$K_j K_{flex} K_{SP}^2$
95	$\left[C_R'(1-\lambda')(RS - FS)_\perp\right]/b_s'/2)$
96	$C_{TIP}\ (RS - FS)_\perp$
97	$\left[C_R'AC\ (1-\lambda'\sigma')(t/c)'\right]/(b_s'/2)$
98	$C_{TIP}\ AC\ (t/c)'\sigma'$
99	$\left[C_R'(1-\lambda')\right]/(b_s'/2)$
100	$C_R'\lambda'$

TABLE 193. CTBW ARRAY

General information for array CTBW:

Blank common reference location = T(1541)

Array size = 150 cells

Array CTBW contains design information computed for the torque box. Array data are used in overlay (17,0) for mass distribution calculations. Metallic analysis subroutine PRØG, overlay (9,0), and advanced composite analysis subroutine ACPRØG, overlay (18,0), create CTBW arrays for each of three grossweights that are evaluated from the results of synthesis and weight analysis routines. Each set is saved on mass storage file 1, records 156, 157, and 158. Subroutine WØDATA, overlay (17,0), uses data from these records as inputs to data arrays for torque-box mass distribution calculations by subroutine TBFWI. The torque-box stiffness information stored in the grossweight 2 data set is processed for use by subroutines WFLDD and WFLDD, the output data generation routines for support of the stand-alone flexible loads and flutter optimization programs.

The contents of array CTBW for each gross weight are printed by subroutine WØDATA under control of IP(38), case control card 1, column 38.

Array Location	Data Source	Description
1-11	TBWPI	$Z_{TB}(1\text{-}11)$, torque-box structure weight at each analysis control station, lb/inch.
12-22	TBCWT	$\Delta W_{conc}(1\text{-}11)$, incremental weights at each analysis control station for local chordwise torque-box structures, assumed to be uniformly distributed between the front and rear spars at the station, lb/side.
23-33	-	$EI_{(1\text{-}11)}$, torque-box bending stiffness at each analysis control station. Flutter design EI values stored in CD(34) through CD(44) are used for metallic design. The modulus of elasticity value stored in TWT(173) is used for the EI calculations. The TWT(173) value is created by subroutine CNSTC, overlay (16,0). For advanced composite torque boxes, the EI values stored in CD(276) through CD(286) are used by advanced composite torque-box stiffness data array EICFL). These values reflect lamina

TABLE 193. CTBW ARRAY (CONT)

Array Location	Data Source	Description
		properties for the flexible analysis design temperature stored in TEIGJ(3).
34-44	-	$GJ_{(1-11)}$, torque-box torsional stiffness at each analysis control station. In metallic design, from CD(23) through CD(33), based on G-value stored in TWT(174). For advanced composite torque boxes, from CD(265) through CD(275) (torque-box stiffness data array GJCFL), based on design temperature stored in TEIGJ(3).
45	DEVF	E_{ref}, reference modulus of elasticity for preceding EI values, to be used for scaling of metallic structure EI values by WFLDD and WVFDD. Subroutine WFLDD is programmed to use this value to compute EI scale factor; therefore, for advanced composite torque-boxes, the input data value in location D(290) must be specified as 0.0 or, if scaling is required, with a value of less than 10.0. Subroutine WVFDD does not use this value for advanced composite torque boxes.
46	DGVF	G_{ref}, reference modulus of rigidity for preceding GJ values. Same as for E_{ref}.
47	SDRHØ	ρ_{ref}, reference torque-box material density, lb/cu in.
48-57	WPNLS	$W_{TB\ pnl}(1-10)$, panel weights for torque-box structures for strength design only, lb/side.
58-67	TPNLW	$W_{tot\ pnl(1-10)}$, total torque-box panel weights, lb/side.
69-77	DPCDL	$W_{\Delta CDL\ pnl}(1-10)$, structure provision weights for the 7 concentrated masses in the 10 torque-box panels, lb/side.
78-88	TMWP1	Z_{MISC} (1-11), weight per inch values for surface secondary structures, based on δ_{MISC} (D(604)), lb/in.
89-99	VFWP1	Z_{VF} (1-11), weight per inch values for torque-box structure increment due to flutter stiffness requirements, lb/in.
(100-110)	(SWT)	Total weight summary data. Array SWT created by subroutine TBØPT, overlay (9,0), or ATBØPT, overlay (18,0).

TABLE 193. CTBW ARRAY (CONCL)

Array Location	Data Source	Description
100	SWT(1)	$\Sigma W_{SURFACE}$, total surface structure weight, lb/air vehicle.
101	SWT(2)	$\Sigma W_{\emptyset PNL}$, total outer panel structure weight, lb/air vehicle.
102	SWT(3)	$\Sigma W_{PIV\emptyset T}$, total pivot structure weight, lb/air vehicle.
103	SWT(4)	$\Sigma W_{C\text{-}SEC}$, total center-section structure weight, lb/air vehicle.
104	SWT(5)	ΣW_{TB}, total torque-box structure weight, lb/air vehicle
105	SWT(6)	ΣW_{LE}, total leading edge structure weight, lb/air vehicle.
106	SWT(7)	ΣW_{TE}, total trailing edge structure weight, lb/air vehicle.
107	SWT(8)	$\Sigma MISC$, total secondary structure weight, lb/air vehicle
108	SWT(9)	W_{TIP}, surface tip structure weight, lb/air vehicle.
109	SWT(10)	$\Sigma W_{\Delta T\text{-}tail}$, T-tail structure provision weights, lb/air vehicle. (Note: This item is not computed; storage cell is allocated for future use.)
110	SWT(11)	$\Sigma \Delta W_{VF}$, total weight increment due to flutter stiffness requirements, lb/air vehicle.
111-121	ACVFDE	$E_{VF}(1\text{-}11)$, equivalent modulus of elasticity for advanced composite torque boxes only. Values reflect design temperature specified in TEIGJ(3). Subroutine ACPRØG creates ACVFDE values from CD(298) through CD(308) (advanced composite torque-box stiffness data array ECFL). ACVFDE is set to 0.0 value by subroutine PRØG for metallic torque boxes.
122-132	ACVFDG	$G_{VF}(1\text{-}11)$, equivalent modulus of rigidity for advanced composite storque boxes only. Same as preceding $E_{VF}(1\text{-}11)$, created from CD(289) through CD(297) (stiffness data array GCFL).
133-150	-	Not used.

TABLE 194. CTBI ARRAY

General information for array CTBI:

Blank common reference location = CD(351)

Array size = 150 cells

Array CTBI contains mass distribution data for torque-box structures computed by subroutine TBFWI, overlay (17,0). Subroutine WØDATA creates CTBI data from TBFWI outputs stored in array TCS, locations 1 through 150. Torque-box mass distributions are computed for gross weight 2 only. WØDATA saves CTBI on mass storage file 1, record 155. Array CTBI is recreated later from this source for total surface mass distribution calculations, and for processing of output data for the flexible loads and flutter optimization programs by subroutines WFLDD and WVFDD. WØDATA prints the contents of array CTBI under control of IP(38), case control card 1, column 38.

Array Location	Description
	Locations 1 through 36 contain mass distribution data integrated in the weight analysis-reference system.
1	0.0, not required.
2-11	$\Sigma W_{pnl}(1\text{-}10)$, weight of torque-box structures between control stations 1-11.
12-13	0.0, not required.
14-23	$\Sigma(W \cdot \Delta Y_\Lambda)_{pnl}(1\text{-}10)$, sum of grid spanwise moments for the preceding 10 weight panels. Moments are computed at the inboard control station, $Y_{\Lambda i}$, of each panel.
24-25	0.0, not required.
26-35	$\Sigma(W \cdot \Delta X_\Lambda)_{pnl}(1\text{-}10)$, sum of grid chordwise moments for the preceding 10 weight panels. Moments are computed at the inboard control station, $X_{\Lambda i} = 0.0$, of each panel.
36	0.0, not required.
	Locations 37 through 91 contain mass distribution data integrated in the flutter optimization reference system. This data set contains data for the 11 structural strip panels defined for the 11 structural analysis control stations $Y_{\Lambda(1\text{-}11)}$, (TG(1) - TG(11)). The spanwise panel boundaries are defined by $Y'_{\Lambda(1\text{-}12)}$, (TG(45) - TG(56)). All weights, moments, and inertias are summed to the structural analysis control station for the panel ($Y_{\Lambda i}$, $X_{\Lambda i} = 0.0$).

TABLE 194. CTBI ARRAY (CONT)

Array Location	Description
37-47	$\Sigma W_{pnl(1-11)}$, sum of grid weights for the structural strip panels defined for flutter optimization.
48-58	$\Sigma(W \cdot \Delta Y_\Lambda)_{pnl(1-11)}$, sum of grid spanwise moments for the preceding 11 weight panels, computed at the structural analysis control station, $Y_{\Lambda i}$, of each panel.
59-69	$\Sigma(W \cdot \Delta X_\Lambda)_{pnl(1-11)}$, sum of grid chordwise moments for the preceding 11 weight panels, computed at the structural analysis control station, $X_{\Lambda i} = 0.0$, of each panel.
70-80	$\Sigma(I_{Y\Lambda})_{pnl(1-11)}$, pitch inertia for the preceding 11 weight panels, computed at the structural analysis control station, $Y_{\Lambda i}$, of each panel, $(I_{Y\Lambda})_i = \Sigma(W \cdot \Delta X_\Lambda^2)_i + \Sigma(I_{OY\Lambda})_i$
81-91	$\Sigma(I_{X\Lambda})_{pnl(1-11)}$, roll inertia for the preceding 11 weight panels, computed at the structural analysis control station, $X_\Lambda = 0.0$, of each panel, $(I_{X\Lambda})_i = \Sigma(W \cdot \Delta Y_\Lambda^2)_i + \Sigma(I_{OX\Lambda})_i$.
Locations 92 through 146 contain mass distribution data integrated in the flexible loads analysis reference system. This data set is sized to contain 11 aerodynamic strip panels; however, data for only 10 panels are computed. The panel boundaries are defined in TGA(1) - TGA(11). Integration control stations for each panel, $(Y,X)_i$, are defined in TGA(23) - TGA(42).	
92-101	$\Sigma W_{pnl(1-10)}$, sum of grid weights for the 10 aerodynamic strips defined for flexible loads analysis.
102	0.0, not required.
103-112	$\Sigma(W \cdot \Delta Y)_{pnl(1-10)}$, sum of grid spanwise moments for the preceding 10 weight panels, computed at the integration control station, Y_i, defined in TGA(23) - TGA(32).
113	0.0, not required.
114-123	$\Sigma(W \cdot \Delta X)_{pnl(1-10)}$, sum of grid chordwise moments for the preceding 10 weight panels, computed at the integration control station X_i, defined in TGA(33) - TGA(42).

TABLE 194. CTBI ARRAY (CONCL)

Array Location	Description
124	0.0, not required.
125-134	$\Sigma(I_Y)_{pnl(1-10)}$, pitch inertia for the preceding 10 weight panels, computed at the integration control station, Y_i. $(I_Y)_i = \Sigma(W \cdot \Delta X^2)_i + \Sigma(I_{OY})$.
135	0.0, not required.
136-145	$\Sigma(I_X)_{pnl(1-10)}$, roll inertia for the preceding 10 weight panels, computed at the integration control station X_i. $(I_X)_i = \Sigma(W \cdot \Delta Y^2)_i + \Sigma(I_{OX})_i$.
147-150	Not required. These locations will contain 1-g shear values for stations 1 through 4. Data computed by TBFWI and transferred from TCS(147 - TCS (150) by WØDATA.

TABLE 195. WCG ARRAY

General information for array WCG:

Blank common reference location = TW(701)

Array size = 126 cells

Array WCG contains estimated centers-of-gravity coordinates for the total surface and major surface components. Coordinates in the vehicle reference system, (Y,X), and the surface structural system, (Y_Λ, X_Λ), are computed for each gross weight that is evaluated. The information is computed by subroutine WØDATA based on final sizing data for the torque boxes and on the CG information computed in overlays (8,0), (14,0), and (15,0) for the other components. WCG data are used by subroutine PRTD for output of surface weight summary information.

Array locations are initialized to 0.0 value by subroutine WØDATA before computations are made. WØDATA prints the contents of WCG under control of IP(38), case control card, column 38.

Array Location	Description
1-3	Y_{CG} GW(1-3) total surface structure weights.
4-6	X_{CG} GW(1-3), total surface weights.
7-9	$Y_{\Lambda CG}$ GW(1-3), (Y_{CG}, X_{CG}) preceding.
10-12	$X_{\Lambda CG}$ GW(1-3), (Y_{CG}, X_{CG}) preceding.
13-24	CG coordinates for total outer panel structure weights.
25-36	CG coordinates for center-section structure weights. Y_{CG} values assumed as 0.5 ($b_1/2$). X_{CG} values assumed to be for mid-chord station of the center section.
37-48	CG coordinates for pivot structure weights, assumed to be at the pivot point (Y_{PVT}, X_{PVT}).
49-60	CG coordinates for secondary structure weights, assumed to be the same as for the torque box.
61-72	CG coordinates for torque-box structure weights.
73-84	CG coordinates for total leading edge structure weights.
85-96	CG coordinates for total trailing edge structure weights.
97-108	CG coordinates for tip structure weights.
109-120	CG coordinates for miscellaneous outer panel weights, same as locations 49 through 60.
121-126	Not used.

TABLE 196. ACL ARRAY

General information for array ACL:

Blank common references location = CT(1)

Array size = 900 cells

Array ACL contains gross limit airloads and design condition data processed by subroutine ACLØAD, overlay (18,0) for use by subroutine AVLØAD during computations of net ultimate design loads for advanced composite torque-box analysis. ACL contains the necessary data for up to 20 design conditions and is saved on mass storage file 1, record 30, by ACLØAD. Subroutine AVLØAD reinitializes array ACL from this data source during each pass in the gross weight/deadweight iteration loop controlled by subroutine ACPRØG.

The contents of ACL will depend upon the load calculation options selected for the analysis. Data for two sets of design loads will be created if the load option for module calculations or input loads is selected. Loads information created and processed by subroutine ALØAD, overlay (16,0) is used as the data source. Selection of the option to utilize data computed by the airloads module of SWEEP results in processing of the BØ array data stored on mass storage file 1, records 160 through 183, by subroutine MAXLDS, overlay (4,0).

Subroutine ACLØAD processes information for only those design conditions for which BØ data records have been created by MAXLDS. Computed design condition data is indicated by the status of code words in array WHVLID. The processed information are sequentially stored in array ACL.

Array ACL data created for vertical tails from array BØ data are created to contain a maximum of 10 design loads sets only. This restriction is programmed so that equal and opposite load sets can be created. The advanced composite synthesis routines can then evaluate the effects of both tension and compression loads for each design condition during the separate analysis passes made for each cover. Processing of T-tail vertical tail loads are made in reverse order; i.e., from load set record 183 back to 160. Sets created for SWEEP design conditions A14WV through A17WV are not processed.

Array ACL is initialized to 0.0 values before data are processed into the array. At the conclusion of data processing, subroutine ACLØAD prints the contents of ACL under control of IP(20), case control cards 1, column 20.

Airloads module output array BØ is renamed WBØ when used by subroutine ACLØAD. For data definitions, refer to Table 24, Volume III, "Airloads Estimation Module."

TABLE 196. ACL ARRAY (CONT)

Array Location	Description
Locations 1 through 660 contain limit airloads shears and moments for the 11 structural analysis stations. This data set will contain up to 20 consecutively stored sets of design airloads, each 33-cell set consisting of 11 shears followed by 11 bending moments and ending with 11 torsional moments. These load items are stored root-to-tip. (NOTE: Load sets 1 and 2 will always exist. Load sets 3 through 20 will depend upon contents of array WHVLID.)	
1-11	$V_{\Lambda}(1\text{-}11)$ cond 1, design airload shears, first load set, lb.
12-22	$M_{X\Lambda}(1\text{-}11)$ cond 1, design bending moments, first load set, in.-lb.
23-33	$M_{Y\Lambda}(1\text{-}11)$ cond 1, design torsional moments, first load set, in.-lb.
34-66	Load set 2.
67-99	Load set 3.
100-132	Load set 4.
133-165	Load set 5.
166-198	Load set 6.
199-231	Load set 7.
232-264	Load set 8.
265-297	Load set 9.
298-330	Load set 10.
331-363	Load set 11.
364-396	Load set 12.
397-429	Load set 13.
430-462	Load set 14.
463-495	Load set 15.
496-528	Load set 16.
529-561	Load set 17.
562-594	Load set 18.
595-627	Load set 19.
628-660	Load set 20.
Locations 661 through 900 contain pertinent design condition information associated with each processed loads set stored in the foregoing locations 1 through 660.	

TABLE 196. ACL ARRAY (CONCL)

Array Location	Description
661-680	$N_{Z}(1\text{-}20)$, load factor.
681-700	TEMP(1-20), surface structural design temperature, from BØ(186) for wing, BØ(187) for horizontal tails and BØ(188) for vertical tails.
701-720	$R_{DW}(1\text{-}20)$, factor for deadweight loads, (+1.0) for wings and vertical tails ($\dot{Q}/\lvert\dot{Q}\rvert$) for horizontal tails ($\dot{Q}$ = BØ(20)).
721-740	$R_{FL1}(1\text{-}20)$, factor for fuel cell 1 loads, ratio of remaining fuel plus fuel system weight to total at takeoff.
741-760	$R_{FL2}(1\text{-}20)$, factor for fuel cell 2 loads, same as for 1.
761-780	$R_{CDL1}(1\text{-}20)$, factor for concentrated mass 1, ratio of remaining store weight to total at takeoff.
781-800	$R_{CDL2}(1\text{-}20)$, factor for concentrated mass 2, same as for 1.
801-820	TØGW(1-20), takeoff gross weight, lb/air vehicle.
821-840	DGW(1-20), vehicle weight at design, lb/air vehicle.
841-860	COND NO(1-20), design condition number, same as variable ACNWV in Table 24, Volume III.
861-880	$\Delta FL_{1\text{-}20}$, consumed fuel out to design weight, lb/air vehicle.
881-900	$\Delta UL_{1\text{-}20}$, expended useful load out to design weight, lb/air vehicle.

TABLE 197. ACLT ARRAY

General description for array ACLT:
Blank common reference location = CD(532)
Array size = 66 cells
Array ACLT is used by subroutine AVLØAD for storage and retrieval of gross air load shears and moments, and for storage of computed design loads during computations of net ultimate loads for advanced composite structure analysis. Locations 1 through 33 are used to store load values from array ACL for each design load condition processed. Computed design loads are stored in locations 34 through 66 for later processing into array ACVMT. The contents of array ACLT are printed after each load set has been processed under control of IP(24) or IP(25), case control card 1, columns 24 and 25.

Array Location	Description
1-11	$V_{\Lambda(1-11)i}$, limit airload shears at structural analysis control stations 1 through 11 for load set i.
12-22	$M_{X\Lambda(1-11)i}$, limit airload bending moment, load set i.
23-33	$M_{Y\Lambda(1-11)i}$, limit airload torsional moment, load set i.
34-44	$V_{\Lambda(1-11)i}$, net ultimate shear at structural analysis control stations 1 through 11 for load set i.
45-55	$M_{X\Lambda(1-11)i}$, net ultimate bending moment, load set i.
56-66	$M_{Y\Lambda(1-11)i}$, net ultimate torsional moment, load set i.

TABLE 198. ACVMT AND V ARRAYS

General information for arrays ACVMT and V:

Blank common reference location = CT(1321)

Array sizes = 660 cells

Array dimensions: ACVMT = 1320, V = (3,11,20)

Arrays ACVMT and V are identical arrays containing net ultimate designs loads for advanced composite torque-box analysis. Subroutine AVLØAD uses array name ACVMT. Array name V is used by subroutines ACWMS and ACWRBS, accessing the design loads information through indexes (i,j,k), where i = load type (shear, bending moment and torsional moment), j = analysis control station and k = design load condition set.

Subroutine AVLØAD creates ACVMT data from array ACLT, locations 34 through 66. The number of load sets stored in ACVMT is governed by the value of variable ILCASE, the number-of-design loads counter for advanced composite analysis. ACVMT is initialized to 0.0 values by AVLØAD before processing of loads data. The contents of ACVMT are not printed; however, AVLØAD prints array ACLT under control of IP(24) or IP(25), case control card 1, columns 24 and 25.

Array Location		Description
ACVMT	V	
1	1,1,1	$V_{\Lambda 1\ (LD\ 1)}$, net ultimate shear, station 1, load set 1.
2	2,1,1	$M_{X\Lambda 1\ (LD\ 1)}$, net ultimate bending moment, station 1, load set 1.
3	3,1,1	$M_{Y\Lambda 1\ (LD\ 1)}$, net ultimate torsional moment, station 1, load set 1.
4	1,2,1	$V_{\Lambda 2\ (LD\ 1)}$, station 2, load set 1.
5	2,2,1	$M_{X\Lambda 2\ (LD\ 1)}$, station 2, load set 1.
6	3,2,1	$M_{Y\Lambda 2\ (LD\ 1)}$, station 2, load set 1.
7-9	(1-3),3,1	V_{Λ}, $M_{X\Lambda}$, $M_{Y\Lambda}$ for station 3, load set 1.
10-12	(1-3),4,1	V_{Λ}, $M_{X\Lambda}$, $M_{Y\Lambda}$ for station 4, load set 1.
13-15	(1-3),5,1	V_{Λ}, $M_{X\Lambda}$, $M_{Y\Lambda}$ for station 5, load set 1.
16-18	(1-3),6,1	V_{Λ}, $M_{X\Lambda}$, $M_{Y\Lambda}$ for station 6, load set 1.
19-21	(1-3),7,1	V_{Λ}, $M_{X\Lambda}$, $M_{Y\Lambda}$ for station 7, load set 1.
22-24	(1-3),8,1	V_{Λ}, $M_{X\Lambda}$, $M_{Y\Lambda}$ for station 8, load set 1.

TABLE 198. ACVMT AND V ARRAYS (CONCL)

Array Location		Description
ACVMT	V	
25-27	(1-3),9,1	V_A, M_{XA}, M_{YA} for station 9, load set 1.
28-30	(1-3),10,1	V_A, M_{XA}, M_{YA} for station 10, load set 1.
31-33	(1-3),11,1	V_A, M_{XA}, M_{YA} for station 11, load set 1.
34-66	(1-3),(1-11),2	Shears and moment, stations 1 through 11, load set 2.
67-99	(1-3),(1-11),3	Load set 3.
100-132	(1-3),(1-11),4	Load set 4.
133-165	(1-3),(1-11),5	Load set 5.
166-198	(1-3),(1-11),6	Load set 6.
199-231	(1-3),(1-11),7	Load set 7.
232-264	(1-3),(1-11),8	Load set 8.
265-297	(1-3),(1-11),9	Load set 9.
298-330	(1-3),(1-11),10	Load set 10.
331-363	(1-3),(1-11),11	Load set 11.
364-396	(1-3),(1-11),12	Load set 12.
397-429	(1-3),(1-11),13	Load set 13.
430-462	(1-3),(1-11),14	Load set 14.
463-495	(1-3),(1-11),15	Load set 15.
496-528	(1-3),(1-11),16	Load set 16.
529-561	(1-3),(1-11),17	Load set 17.
562-594	(1-3),(1-11),18	Load set 18.
595-627	(1-3),(1-11),19	Load set 19.
628-660	(1-3),(1-11),20	Load set 20.

TABLE 199. TEIGJ ARRAY

General information for array TEIGJ:

Blank common reference location = TW(783)

Array size = 4 cells

Array TEIGJ contains special evaluation temperatures for advanced composite designs. This temperature set is determined by subroutine ACPRØG, overlay (18,0) for use by subroutine TEMPC for computations of the at-temperature material properties necessary for bending and torsional stiffness calculations. The material stiffness characteristics for these temperatures are stored in array ENQC.

Array Location	Description
1	$T_{ST\ DES}$, reference temperature for output of stiffness characteristics, strength design, °F. Represents selected temperature to be used to compute nominal stiffness distribution information for output evaluation. This value is always specified. Desired evaluation temperature can be specified in input data location D(281), variable DTMPB. If DMTPB is specified as a 0.0 or negative value, the temperature value for basic torque-box design, DMTLB(1) is used. (Note: DMTLB(1) is derived from D(259), variable DMT.)
2	$T_{VF\ DES}$, design temperature for flutter design, °F. Computed only if flutter analysis is to be made. Temperature value specified in D(282), variable VFDTMP.
3	$T_{FØ\ DES}$, evaluation temperature for torque-box stiffness characteristics for flutter optimization output, °F. Computed only if data generation option for flutter optimization design data is selected. Temperature is specified in D(283), variable DTMPFØ. If this input value is 0.0 or negative, the value in location 1 is used.
4	$T_{FL\ DES}$, evaluation temperature for torque-box stiffness characteristics for flexible loads output, °F. Computed only if data generation option for flexible loads design data is selected. Temperature is specified in D(284), variable DTMPFL. If this input value is 0.0 or negative, the value in location 1 is used.

TABLE 200. ENQ ARRAY

General information for array ENQ:

Blank common reference location = TW(601)

Array size = 100 cells

Array dimension = (5,20)

Array ENQ contains material stiffness parameters for the 20 load cases that can be evaluated by the advanced composite torque-box synthesis routines. The design temperatures for these properties are specified in array TEMP, created by subroutine ACLØAD. The stiffness parameters in ENQ are computed by subroutine TEMPC. This data set is used to compute stability allowables for plate laminates which are assumed to be configured as a balanced, symmetric laminate of the form $[0^\circ_1/\pm45^\circ_m/90^\circ_n]_s$. The array is organized so that the i-index of the (i,j) array dimension refers to the 5 applicable Q matrix elements for each temperature specified by the j-index. The ENQ array is printed by subroutine TEMPC under control of IP(19), case control card 1, column 19, for each load to be evaluated.

Relative Core Location	Array Index Value	Description
1	1,1	Q^0_{11} for load set 1, Q_{11} term for 0°-ply = $[E_L/(1-\nu_{LT}\nu_{TL})]$. (Also equal to Q_{22} term for 90°-ply.)
2	2,1	Q^0_{22} for load set 1, Q_{22} term for 0°-ply = $[E_T/(1-\nu_{LT}\nu_{TL})]$. (Also equal to Q_{11} term for 90°-ply.)
3	3,1	Q^0_{12} for load set 1, Q_{12} term for 0°-ply = $\nu_{LT}Q^0_{22} = \nu_{LT}Q^0_{11}$. (Also equal to Q_{12} term for 90°-ply.)
4	4,1	Q^{45}_{11} for load set 1, Q_{11} term for ±45°-ply = $0.25\ [Q^0_{11} + Q^0_{22} + 2.0\ (Q^0_{12} + 2.0\ G_{LT})]$. (Also equal to Q_{22} term for ±45°-ply.)
5	5,1	Q^{45}_{12} for load set 1, Q_{12} term for ±45°-ply = $0.25\ [Q^0_{11} + Q^0_{22} + 2.0\ (Q^0_{12} - 2.0\ G_{LT})]$.

TABLE 200. ENQ ARRAY (CONCL)

Relative Core Location	Array Index Value	Description
6-10	(1-5),2	Q-terms for load set 2.
11-15	(1-5),3	Q-terms for load set 3.
16-20	(1-5),4	Q-terms for load set 4.
21-25	(1-5),5	Q-terms for load set 5.
26-30	(1-5),6	Q-terms for load set 6.
31-35	(1-5),7	Q-terms for load set 7.
36-40	(1-5),8	Q-terms for load set 8.
41-45	(1-5),9	Q-terms for load set 9.
46-50	(1-5),10	Q-terms for load set 10.
51-55	(1-5),11	Q-terms for load set 11.
56-60	(1-5),12	Q-terms for load set 12.
61-65	(1-5),13	Q-terms for load set 13.
66-70	(1-5),14	Q-terms for load set 14.
71-75	(1-5),15	Q-terms for load set 15.
76-80	(1-5),16	Q-terms for load set 16.
81-85	(1-5),17	Q-terms for load set 17.
86-90	(1-5),18	Q-terms for load set 18.
91-95	(1-5),19	Q-terms for load set 19.
96-100	(1-5),20	Q-terms for load set 20.

TABLE 201. ENQC ARRAY

General information for array ENQC:

Blank common reference location = TW(787)

Array size = 24 cells

Array dimension = (6,4)

Array ENQC contains material stiffness parameters for the temperature values found in array TEIGJ. These parameters are used to compute stiffness characteristics for the balanced, symmetrical advanced composite laminate with the assumed configuration $[0^\circ_1/\pm45^\circ_m/90^\circ_n]_s$.

Properties for each temperature consists of 6 items, the applicable elements of the Q matrices as defined in Section II, Equations 66 and 68. The array is organized so that the i-index of the (i,j) array dimension refers to the 6 Q-matrix elements and the j-index refer to the 4 temperatures of array TEIGJ.

The ENQC data is computed by subroutine TEMPC. Array locations are initially set to 0.0 values by TEMPC. Subroutine TEMPC prints the Q elements for each temperature evaluated, under control of IP(19), case control card 1, column 19.

Relative Core Location	Array Index Value	Description
1	1,1	Q^0_{11} for $T_{ST\ DES}$, Q_{11} term for 0°-ply = $[E_L/(1-\nu_{LT}\nu_{TL})]$. (Also equal to Q_{22} term for 90°-ply.)
2	2,1	Q^0_{22} for $T_{ST\ DES}$, Q_{22} term for 0°-ply = $[E_T/(1-\nu_{LT}\nu_{TL})]$. (Also equal to Q_{11} term for 90°-ply.)
3	3,1	Q^0_{12} for $T_{ST\ DES}$, Q_{12} term for 0°-ply = $\nu_{LT}Q^0_{22} = \nu_{TL}Q^0_{11}$. (Also equal to Q_{12} term for 90°-ply.)
4	4,1	Q^{45}_{11} for $T_{ST\ DES}$, Q_{11} term for ±45°-ply = 0.25 $[Q^0_{11} + Q^0_{22} + 2.0\ (Q^0_{12} + 2.0\ G_{LT})]$. (Also equal to Q_{22} term for ±45°-ply.)
5	5,1	Q^{45}_{12} for $T_{ST\ DES}$, Q_{12} term for ±45°-ply = 0.25 $[Q^0_{11} + Q^0_{22} + 2.0\ (Q^0_{12} - 2.0\ G_{LT})]$.
6	6,1	Q^{45}_{66} for $T_{ST\ DES}$, Q_{66} term for ±45°-ply = 0.25 $[Q^0_{11} + Q^0_{22} -2.0\ Q^0_{12}]$

TABLE 201. ENQC ARRAY (CONCL)

Relative Core Location	Array Index Value	Description
7-12	(1-6),2	Q-terms for $T_{VF\ DES}$
13-18	(1-6),3	Q-terms for $T_{F\emptyset\ DES}$
19-24	(1-6),4	Q-terms for $T_{FL\ DES}$

TABLE 202. CNT ARRAY

General information for array CNT:		
Blank common reference location = T(1541) Array size = 91 Array CNT is used as a common data source for analysis control word and design constants. Data in this array are used by all advanced composite structural synthesis routines. Most of the information stored in CNT is created by subroutine ATBØPT. The array locations are initially set to 0.0 values before creation of the appropriate design values which are derived from input data specifications for the torque-box design type and optimization options. The contents of array CNT is printed by subroutine ACWMS or ACWRBS under control of APRTID(12).		
Array Location	**Variable Name**	**Description**
1	XSTRU	Code word for type of stringer to be used for upper cover analysis, multirib design only, set up by ATBØPT from D(432), variable ACVSTU. Default value = 1.0 if D(432) specified as 0.0 or negative value. Code value 1-5 interpreted as: 1.0 = "I" stringer, 2.0 = "Z" stringer, 3.0 = "T" stringer, 4.0 = "hat" stringer, 5.0 = not used.
2	XSTRL	Same as the foregoing except for lower cover, from D(433), variable ACVSTL.
3	BRMIN	Minimum rib spacing for multirib design, setup by ATBØPT from D(375), variable STLMN, in.
4	BRMAX	Maximum rib spacing for multirib design, setup by ATBØPT from D(376), variable STLMX. This value must be greater or equal to BRMIN, in.
5	BSMIN	Minimum spar spacing for multispar design or stringer spacing for multirib design, set up by ATBØPT from D(380), variable BMIN, in.
6	BSMAX	Maximum spar spacing for multispar design or stringer spacing for multirib design, set up by ATBØPT from D(381), variable BMAX, in.
7	BWMAX	Maximum stringer height for multirib design, setup by ATBØPT from D(378), variable HSTMX, in.
8	SLUMIN	Minimum number of 0° plies in upper cover skin for multirib design, setup by ATBØPT from D(440), variable DSKLMU.
9	SLLMIN	Minimum number of 0° plies in lower cover skin for multirib design, setup by ATBØPT from D(441), variable DSKLML.

TABLE 202. CNT ARRAY (CONT)

Array Location	Variable Name	Description
10	XTYPE	Code word to indicate the spar or stringer arrangement, equally spaced or constant number of elements, to be used to compute the unsupported skin span b at each station, setup by ATBØPT from D(383), variable STRCN. Code value of 1.0 = constant number of spar or stringer elements, 2.0 = constant spar or stringer spacings.
11	C1	Computed factor for design shear on the front spar web, calculated at each station by ACWMS or ACWRBS, (1/2 K_{VFS} (1-11) · K_{VEA}(1-11)), where KVFS (1-11) are input factors in locations D(842)-D(852), variable DVFS(1-11), and K_{VEA} (1-11) are beam reaction factors for the front spar based on the relative location of the structural reference line to the front and rear spars.
12	C2	Computed factor for design shear on the rear spar web, similar to above for front spar. K_{VRS}(1-11) are the factors input in D(853) - D(863), variable DVRS(1-11).
13	C3	Constant used for rounding operations for integer number of ply calculations, setup by ATBØPT from D(579), variable DKMPLI.
14	C4	Torque box effective width increment to account for bending loads reacted by spar cap and cover overhang material, computed at each station by ACWMS or ACWRBS, in. This increment is added to the local station torque-box width in the computations for cover N_X.
15	STUMIN	Minimum number of 0° plies in the upper cover stringers for multirib designs, setup by ATBØPT from D(442), variable DSTLMU.
16	STLMIN	Minimum number of 0° plies in the lower cover stringers for multispar designs, setup by ATBØPT from D(443), variable DSTLML.
17	NSPMIN	Minimum number of spars (including the front and rear spars) for multispar designs or stringers for multirib designs; setup by ATBØPT from D(382), variable SNMIN. Subroutine ACWRBS identifies this location as NSTRMN. NSPMIN and NSTRMN are specified as real variables.
18	NSPMAX	Maximum number of spars (including front and rear spars) for multispar designs or stringers for multirib designs, setup by ATBØPT from D(399), variable SNMAX. Subroutine ACWRBS identifies this location as NSTRMX. NSPMAX and NSTRMX are specified as real variables.

TABLE 202. CNT ARRAY (CONT)

Array Location	Variable Name	Description
19	XKCØDE	Cover construction code for multispar designs, set up by ATBØPT from D(430), variable ACCVID. Code value of 1.0 = plate construction, 2.0 = honeycomb panel construction. XKCØDE is set to 1.0 for fulldepth honeycomb sandwich and multirib designs.
20	XPCØDE	Internal cover support structure construction code, set-up by ATBØPT from D(435), variable ACSPID. Code value of 1.0 = corrugated intermediate spar or rib webs, 2.0 = honeycomb panel spar or rib webs, 3.0 = fulldepth honeycomb sandwich design.
21	NSPAR	Number of spars (including front and rear spars) for the current analysis station for multispar design, set-up by ACWMS. Number of stringers for multirib design, setup by ACWRBS and identified as variable NSTR. NSPAR and NSTR are specified as real variables.
22	C7	Intermediate spar cap factor for multispar designs, set up by ATBØPT from D(457), variable ACKIC.
23	C8	Number of 90° ply factor, setup by ATBØPT from D(429), variable ACKNP.
24	HS	Effective height of intermediate spars or ribs, for the current analysis station, set up by ACWMS or ACWRBS, in.
25	HF	Effective height of front spar for the current analysis station, set up by ACWMS or ACWRBS, in.
26	HR	Effective height of rear spar for the current analysis station, set ups by ACWMS or ACWRBS, in.
27	XFCØDE	Front spar web construction code setup by ATBØPT from D(436), variable ACFSID. Code value of 1.0 = corrugated web, 2.0 = honeycomb panel.
28	XRCØDE	Rear spar web construction code, setup by ATBØPT from D(437), variable ACRSID, code value of 1.0 = corrugated webs, 2.0 = honeycomb panels.
29	TCPNLU	Upper cover honeycomb core thickness for multispar,honeycomb panel cover designs, set up by ATBØPT from D(462), variable DTC, 0.0 for all other designs, in
30	TCPNLL	Lower cover honeycomb core thickness for multispar honeycomb panel cover designs, set up by ATBØPT from D(466), variable DTCL, 0.0 for all other designs, in.
31	TCPNLI	Intermediate spar or rib web honeycomb core thickness if specificd as honeycomb panel webs, 0.0 if not, set up by ATBØPT from D(458), vairable ACPNLI, in.

TABLE 202. CNT ARRAY (CONCL)

Array Location	Variable Name	Description
32	TCPNLF	Front spar web honeycomb core thickness if specified as honeycomb panel web, 0.0 if not, set up by ATBØPT from D(459), variable ACPNLF, in.
33	TCPNLR	Rear spar web honeycomb core thickness if specified as honeycomb panel web, 0.0 if not, set up by ATBØPT from D(460), variable ACPNLR, in.
34	C9	Equivalent area for upper cover inserts of each intermediate spar location for multispar honeycomb panel cover design, 0.0 for all other designs, used for weight calculation only. Set up by ATBØPT from inserts data in D(465) and D(469), variables DINS and DINRHØ, sq. in.
35	C10	Equivalent area for lower cover inserts, same as C9 except that D(467), variable DINSL, is used, sq. in.
36-39	-	Not used. (These core locations referenced as TSC(36)-TSC(39) variables.)
40	BWMIN	Minimum stringer height for multirib design, set up by ATBØPT from D(377), variable HSTMN, n.
41	BFMAX	Maximum stringer flange width for multirib design, set up by ATBØPT from D(379), variable STFMN, in.
42	BFMIN	Minimum stringer flange width for multirib design, setup by ATBØPT from D(384), variable STFMN, in.
43	XSTIFF	Stringer type code for current cover analysis, multirib design, set up by ACWSTR at the start of upper or lower cover analysis passes.
44-91	-	Not used.

TABLE 203. STRESS ARRAY

General information for array STRESS:

Blank common reference location = CT(1)

Array size = 1320 cells

Array dimension = (6,11,20)

Array STRESS contains design N_X and N_{XY} data for each of the 11 torque-box structural analysis control stations. Data sets for each of the 20 design conditions are stored in this array. Array data is created from locations 1-6 of the WS array for all applicable design conditions during the initial data computation phase for the current analysis control station. The number of design load sets created is governed by the index value of ILCASE, created and stored in ND(41) by subroutine ACLØAD.

Array STRESS is organized so that the i-index of the (i,j,k) array dimension, refers to the 6 design load intensities at each of the 11 stations specified by the j-index. The k-index refers to the design condition data sets.

Relative Core Location	Array Index Value	Description
1	1,1,1	$(N_X)_{upr}$, upper cover design axial load, station 1, load set 1, (+) = compression, (-) = tension, lb/in.
2	2,1,1	$(N_X)_{lwr}$, lower cover design axial load, station 1, load set 1, (+) = compression, (-) = tension, lb/in.
3	3,1,1	$(N_{XY})_{cov}$, cover design shear load, station 1, load set 1, lb/in.
4	4,1,1	$(N_{XY})_{FS}$, front spar web design shear load, station 1, load set 1, lb/in.
5	5,1,1	$(N_{XY})_{IS}$, intermediate spar web design shear load, station 1, load set 1, multispar design only, lb/in.
6	6,1,1	$(N_{XY})_{RS}$, rear spar web design shear load, station 1, load set 1, lb/in.
7-12	(1-6),2,1	Design loads, station 2, load set 1.
13-18	(1-6),3,1	Design loads, station 3, load set 1.
19-24	(1-6),4,1	Design loads, station 4, load set 1.
25-30	(1-6),5,1	Design loads, station 5, load set 1.

TABLE 203. STRESS ARRAY (CONCL)

Relative Core Relation	Array Index Value	Description
31-36	(1-6),6,1	Design loads, station 6, load set 1.
37-42	(1-6),7,1	Design loads, station 7, load set 1.
43-48	(1-6),8,1	Design loads, station 8, load set 1.
49-54	(1-6),9,1	Design loads, station 9, load set 1.
55-60	(1-6),10,1	Design loads, station 10, load set 1.
61-66	(1-6),11,1	Design loads, station 11, load set 1.
67-132	(1-6),(1-11),2	Design loads, stations 1-11, load set 2.
133-198	(1-6),(1-11),3	Design loads, stations 1-11, load set 3.
199-264	(1-6),(1-11),4	Design loads, stations 1-11, load set 4.
265-330	(1-6),(1-11),5	Design loads, stations 1-11, load set 5.
331-396	(1-6),(1-11),6	Design loads, stations 1-11, load set 6.
397-462	(1-6),(1-11),7	Design loads, stations 1-11, load set 7.
463-528	(1-6),(1-11),8	Design loads, stations 1-11, load set 8.
529-594	(1-6),(1-11),9	Design loads, stations 1-11, load set 9.
595-660	(1-6),(1-11),10	Design loads, stations 1-11, load set 10.
661-726	(1-6),(1-11),11	Design loads, stations 1-11, load set 11.
727-792	(1-6),(1-11),12	Design loads, stations 1-11, load set 12.
793-858	(1-6),(1-11),13	Design loads, stations 1-11, load set 13.
859-924	(1-6),(1-11),14	Design loads, stations 1-11, load set 14.
925-990	(1-6),(1-11),15	Design loads, stations 1-11, load set 15.
991-1056	(1-6),(1-11),16	Design loads, stations 1-11, load set 16.
1057-1122	(1-6),(1-11),17	Design loads, stations 1-11, load set 17.
1123-1188	(1-6),(1-11),18	Design loads, stations 1-11, load set 18.
1189-1254	(1-6),(1-11),19	Design loads, stations 1-11, load set 19.
1255-1320	(1-6),(1-11),20	Design loads, stations 1-11, load set 20.

TABLE 204. ENX ARRAY

General information for array ENX:

Blank common reference location = TW (701)

Array size = 60 cells

Array dimension = (3,20)

Array ENX contain allowable lamina loads for the 20 load conditions analyzed for advanced composite torque-boxes. These allowable at-temperature loads are used to compute the number of l and m plies (0° and ±45°) required to resist applied tension, compression and shear loads on the web members of the torque-box. This array is organized so that the i-index of the (i,j) array dimension refers to the three computed allowable lamina loads for the 20 load conditions specified by the j-index. In the notation used for defining the ply makeup of a laminate, $[0^\circ_l/\pm45^\circ_m/90^\circ_n]_S$, l, m and n, the number of plies for each filament direction, refers to the ply-set in one-half of the laminate. Thus, since the load intensity values, $+N_X$, $-N_X$ and N_{XY}, are computed for the total laminate, the lamina allowable loads are computed for two plies. Computed values stored in array ENX are printed by subroutine TEMPC under control of IP(19), case control card 1, column 19. Subroutines ACWMS and ACWRBS prints the contents of array ENX at the start of each torque-box synthesis pass if APRTID(12) contains a positive nonzero value. The print code values in array APRTID are computed by subroutine ATBØPT based on input specifications in D(574)-D(578), data array DBKP. This print control array is used for detail analysis data print at selected analysis control stations.

Relative Core Location	Array Index Value	Description
1	1,1	Allowable compression N_X for two 0° plies, load set 1. $(+N_X)_{allow} = 2.0\ t_L F_0^{cu}$, where t_L = lamina thickness, lb/in.
2	2,1	Allowable tension N_X for two 0° plies, load set 1. $(-N_X)_{allow} = 2.0\ t_L F_0^{tu}$, lb/in.
3	3,1	Allowable shear N_{XY} for two +45° and two -45° plies, load set 1. $(N_{XY})_{allow} = 4.0\ t_L F_{45}^{su}$, lb/in.

TABLE 204. ENX ARRAY (CONCL)

Relative Core Location	Array Index Value	Description
4-6	(1-3),2	Allowable lamina loads, load set 2.
7-9	(1-3),3	Allowable lamina loads, load set 3.
10-12	(1-3),4	Allowable lamina loads, load set 4.
13-15	(1-3),5	Allowable lamina loads, load set 5.
16-18	(1-3),6	Allowable lamina loads, load set 6.
19-21	(1-3),7	Allowable lamina loads, load set 7.
22-24	(1-3),8	Allowable lamina loads, load set 8.
25-27	(1-3),9	Allowable lamina loads, load set 9.
28-30	(1-3),10	Allowable lamina loads, load set 10.
31-33	(1-3),11	Allowable lamina loads, load set 11.
34-36	(1-3),12	Allowable lamina loads, load set 12.
37-39	(1-3),13	Allowable lamina loads, load set 13.
40-42	(1-3),14	Allowable lamina loads, load set 14.
43-45	(1-3),15	Allowable lamina loads, load set 15.
46-48	(1-3),16	Allowable lamina loads, load set 16.
49-51	(1-3),17	Allowable lamina loads, load set 17.
52-54	(1-3),18	Allowable lamina loads, load set 18.
55-57	(1-3),19	Allowable lamina loads, load set 19.
58-60	(1-3),20	Allowable lamina loads, load set 20.

TABLE 205. EL ARRAY

General information for array EL:

Blank common reference location = T(1300)

Array size = 15 cells

Array EL contains the number of l, m and n plies for the five torque-box web members that are synthesized at each structural analysis control station. This array is used as the storage and retrieval source by all advanced composite synthesis and analysis routines. Final design laminate configuration information from this array is used to create the station-station information stored in real data array IEL. Locations 1-6 of array EL is initially used for storage of number of l and m plies required for strength, during the evaluation of each design load set for the analysis control station being analyzed. This procedure is designed to select the l and m ply sets that are required for critical strength design; l plies for the upper and lower skins for compression or tension loads and m plies for shears in the upper end lower cover skins, front and rear spar webs and intermediate spar webs for multispar designs. Array EL is then initialized with integer values reflecting the strength-critical set of l and m plies of each web. The array data is then used in the stability check and resizing procedures programmed for each web; m and n plies are changed as required to satisfy web stability requirements. All l, m and n values represent required number of 0°, ±45° and 90° plies in each half-laminate of the webs.

Array Location	Description
	The following descriptions for locations 1 through 6 are for the data initially computed during the design loads evaluation phase at each station.
1	Upper cover 0° ply requirement for the current load set, tension = $-N_X$, compression = $+N_X$. Value computed as $[(-N_X)/(-N_X)_{allow} + C3]$ or $[(+N_X)/(+N_X)_{allow} + C3]$. C3 = 0.999, constant for rounding the computed values up to the next higher integer. (Note: The critical values are selected first before integer values are computed.)
2	Lower cover 0° ply requirement for the current load set, tension or compression, same as for upper cover.

TABLE 205. EL ARRAY (CONT)

Array Location	Description
3	Upper and lower cover ±45° ply requirement for the current load set torque shear, $(N_{XY})_{cov}$. Value computed as $[(N_{XY})_{cov}/(N_{XY})_{allow} + C3]$.
4	Front spar web ±45° ply requirement for the current load set shear, $(N_{XY})_{FS}$. Value computed as $[(N_{XY})_{FS}/(N_{XY})_{allow} + C3]$.
5	Intermediate spar web ±45° ply requirement for the current load set shear, $(N_{XY})_{IS}$. Value computed as $[(N_{XY})_{IS}/(N_{XY})_{allow} + C3]$. The value of $(N_{XY})_{IS}$ is computed for multispar designs only; this value is set to 0.0 for fulldepth honeycomb sandwich and multirib designs.
6	Rear spar web ±45° ply requirement for the current load set shear, $(N_{XY})_{RS}$. Value computed as $[(N_{XY})_{RS}/(N_{XY})_{allow} + C3]$.

The following descriptions for locations 1 through 15 are for the array data created and used during the synthesis analysis of the torque-box. The final laminate l, m and n plies for the torque-box webs are stored in these locations. General and special rules governing the creation of data values in these locations are:

- All number of plies are created and used as integer values, minimum value = 1.0 except locations 10,11 and 12 are set to 0.0 for full depth honeycomb sandwich design.
- Initial values in locations 1,2,4,5,8,11 and 14 are created from the required ply values for strength design.
- L-ply values for vertical webs in locations 7,10 and 13 are based on crushing loads on the webs
- M-ply values in locations 2,5,8,11 and 14 are adjusted as required to satisfy plate buckling requirements.
- N-ply values are always computed for any (l,m) set based on the integer value of $C8 \cdot (l + 2m) + C3$, where C8 is the assumed minimum ratio of n-plies to the total number of l and m plies in the laminate.

TABLE 205. EL ARRAY (CONCL)

Array Location	Description
	• Initial cover m-ply values, locations 2 and 5, for multispar designs are tested and adjusted as required to larger starting values to reduce computation time in the stability evaluation loop. These adjustments are made from previously calculated data consisting of final design m-ply data from the previous synthesis pass and from the final design m-ply data for the previous station design of the current synthesis pass. • Cover l-ply values, locations 1 and 4, for multirib designs are initially computed to represent total cover requirements. The analysis under control of ACWSTR uses these values as sizing limit values in the determination of l-ply distribution in the cover skin and stringer elements. The final value in these locations plus the m- and n-ply values in locations 2,3,5 and 6, represent the cover skin laminate configuration resulting from the ACWSTR calculations.
1	$l_{upr\ cov}$, number of 0° plies in upper cover skin.
2	$m_{upr\ cov}$, number of ±45° ply-sets in upper cover skin.
3	$n_{upr\ cov}$, number of 90° plies in upper cover skin.
4	$l_{lwr\ cov}$, number of 0° plies in lower cover skin.
5	$m_{lwr\ cov}$, number of ±45° ply-sets in lower cover skin.
6	$n_{lwr\ cov}$, number of 90° plies in lower cover skin.
7	l_{FS}, number of 0° plies in front spar web.
8	m_{FS}, number of ±45° ply-sets in front spar web.
9	n_{FS}, number of 90° plies in front spar web.
10	l_{IS}, number of 0° plies in intermediate spar or rib webs.
11	m_{IS}, number of ±45° ply-sets in intermediate spar or rib webs.
12	n_{IS}, number of 90° plies in intermediate spar or rib webs.
13	l_{RS}, number of 0° plies in rear spar web.
14	m_{RS}, number of ±45° ply-sets in rear spar web.
15	n_{RS}, number of 90° plies in rear spar web.

TABLE 206. IEL ARRAY

General information for array IEL:

Blank common reference location = TW(1)

Array size = 165 cells

Array dimension = (15,11)

Array data type = real

Array IEL contains the final laminate configuration information for the five torque-box webs at the 11 structural analysis control stations. This array is initially used to store current pass data during the synthesis loop and the final design set to be used for stiffness and weight analysis. Array IEL values are for the half-laminate configuration necessary to satisfy strength and stability requirements only. The i-index of the (i,j) array dimension refers to the 15 elements contained in array EL for the 11 analysis control stations specified by the j-index. The EL data sets are stored root to tip.

Relative Core Location	Array Index Value	Description
1	1,1	$l_{upr\ cov}$, station 1.
2	2,1	$m_{upr\ cov}$, station 1.
3	3,1	$n_{upr\ cov}$, station 1.
4	4,1	$l_{lwr\ cov}$, station 1.
5	5,1	$m_{lwr\ cov}$, station 1.
6	6,1	$n_{lwr\ cov}$, station 1
7	7,1	l_{FS}, station 1.
8	8,1	m_{FS}, station 1.
9	9,1	n_{FS}, station 1.
10	10,1	l_{IS}, station 1
11	11,1	m_{IS}, station 1.
12	12,1	n_{IS}, station 1.
13	13,1	l_{RS}, station 1.
14	14,1	m_{RS}, station 1.
15	15,1	n_{RS}, station 1.
16-30	(1-15),2	Laminate configuration set for station 2.
31-45	(1-15),3	Laminate configuration set for station 3.

TABLE 206. IEL ARRAY (CONCL)

Relative Core Location	Array Index Value	Description
46-60	(1-15),4	Laminate configuration set for station 4.
61-75	(1-15),5	Laminate configuration set for station 5.
76-90	(1-15),6	Laminate configuration set for station 6.
91-105	(1-15),7	Laminate configuration set for station 7.
106-120	(1-15),8	Laminate configuration set for station 8.
121-135	(1-15),9	Laminate configuration set for station 9.
136-150	(1-15),10	Laminate configuration set for station 10.
151-165	(1-15),11	Laminate configuration set for station 11.

TABLE 207. SPB ARRAY

General information for array SPB:

Blank common reference location = T(1232)

Array size = 33 cells

Array SPB contains internal support design data for multispar (M/S), multirib (M/R), and fulldepth honeycomb sandwich (FDH) designs. This array is used for storage of spar/stringer spacings or honeycomb core information during the torque-box synthesis loop under control of subroutines ACWMS and ACWRBS. The data type will be dependent upon the basic torque-box design to be analyzed. For each design, the creation and use of the three 11-station data sets is governed by computational requirements for the optimization and input design specification options selected for the analysis. At the conclusion of the optimization loop, the selected spacings for spars or stringers will be the first set stored in locations 1-11.

Array Location	Description
1-11	$b_{i\ 1\text{-}11}$, current pass spacings for intermediate spar or stringers for M/S and M/R designs, in. Initial and subsequent pass values are setup as follows: ● In optimization search option on spacings the initial value will be as specified in D(380), b_{min}; subsequent values are derived as ($b_{i-1} + \Delta b_1$) or ($b_{i-1} \pm \Delta b_2$), depending upon search status. Δb_1 = D(1373) and Δb_2 = Δ (1374). ● In optimization search option on number of elements, the initial value is derived from the corresponding NØS values created in SPN(1-11) (initial value from D(399), $NØS_{max}$). Each station value for b is computed as (b = W/(NØS-1.0)) for M/S, and (b = W/(NØS+1.0)) for M/R, where W = torque-box width at the station and NØS is the number of elements, total number of webs including the front and rear spars for M/S or total number of stringers for M/R. Subsequent pass values are based on new values created for SPN(1-11). ● For input 11-station spacing option, analysis values are derived from input data locations D(765)-D(775), array DCBST(1-11). The initial set is the only one analyzed for this option. ● For input number of element option, analysis values are computed from SPN(1-11) as previously described. The initial set is the only one analyzed for this option. ● In FDH designs, this set is set to 1.0.
12-22	$b_{i-1\ 1\text{-}11}$, spacings for pass (i-1) for M/S and M/R optimization search option only, derived from data set in locations 1-11. In FDH design, initial core density, lb/cu in., from D(1164), ENH(1)

TABLE 207. SPB ARRAY (CONCL)

Array Location	Description
	or from D(776)-D(786) for core densities specified at all 11 stations (this second option processed if D(438), variable ACSSID = 1.0).
23-33	b_{i-2} 1-11, spacings for pass (i-2) for M/S and M/R designs. In FDH designs this set contains core foil density, ρ_f.

TABLE 208. SPN ARRAY

General information for array SPN:

Blank common reference location = T(1265)

Array size = 33 cells

Array SPN contains internal support design data for multispar (M/S), multirib (M/R), and full-depth honeycomb sandwich (FDH) designs. This array is used for storage of number of spar/stringer elements or honeycomb core information during the torque-box synthesis loop under control of subroutines ACWMS and ACWRBS. The three 11-station data sets defined herein are created and used under the same conditions as array SPB (Table 207).

Array Location	Description
1-11	$NØS_{i\ 1-11}$, current pass number of spar or stringer elements for M/S or M/R designs. Initial and subsequent pass values are setup as follows: • For optimization search option on number of elements, the initial value will be as specified in D(399), $NØS_{max}$; subsequent values are derived as $(NØS_{i-1} - \Delta NØS_1)$ or $(NØS_{i-1} \pm \Delta NØS_2)$, depending upon search status. $\Delta NØS_1$ = D(1369) and $\Delta NØS_2$ = D(1370). • For optimization search option on spacings, the initial value is derived from the corresponding b values created in SPB(1-11) (initial values from D(380), b_{min}). Number of elements for each station is computed as [NØS = W/b + 1.0] for M/S, and [NØS = W/B - 1.0] for M/R, where W = torque-box width at the station and b = spacing. Subsequent pass values are computed from the new values created for SPB(1-11). • For the input option of specifying number of elements at each of the 11 stations, analysis values are as specified in D(776) -D(786), array DCNØS(1-11). The initial set is the only one analyzed for this option. • For the input option of specifying spacings at each of the 11 stations, analysis values are computed from SPB(1-11) as previously described. The initial set is the only one analyzed for this option. • For FDH designs, the values in this data set is the core density computed as lb/cu ft.
12-22	$NØS_{i-1\ 1-11}$, number of spar/stringer elements for pass (i-1) for M/S and M/R optimization search option only, derived from data set in locations 1-11. For FDH designs, core foil thickness, t_f, in.
23-33	$NØS_{i-2\ 1-11}$, number of elements for pass (i-2) for M/S and M/R designs. In FDH design, final values for core densities, lb/cu in.

TABLE 209. TF ARRAY

General information for array TF:

Blank common reference location = T(2021)

Array size = 40 cells

Array TF contains structural synthesis data for full-depth honeycomb sandwich design. Subroutines ACWFDH and CKSFDH use TF for storage and retrieval of data for each torque-box section that is analyzed under control of subroutine ACWMS. Array TF is initialized to 0.0 values by ACWFDH at the start of each station analysis. The content of TF is printed by CKSFDH under control of the analysis station print control array, APRTID, locations 1-11.

Array Location	Variable Name	Description
Locations 1 through 9 contain the basic design variables that are used by ACWFDH and CKSFDH. Data in these locations are set up by ACWFDH. Locations 1 through 6 are first initialized with upper and lower cover ℓ-, m- and n-ply data required for strength, (P/A), from EL(1)-EL(6). Skin ply adjustments necessary to satisfy stability requirements are always made to the ply sets in locations 1-3. These values are the final ply set for the cover being analyzed and are processed into the appropriate EL array locations by subroutine ACWFDH after each cover has been analyzed. TF(1)-TF(3) are set to the lower cover strength ply requirements after the conclusion of the upper cover analysis.		
1	-	ℓ_{COV}, 0° plies for cover being analyzed, initially the value in EL(1) for upper, EL(4) for lower.
2	-	M_{COV}, $\pm 45^\circ$ ply sets for cover being analyzed, initially the values in EL(2) for upper, EL(5) for lower.
3	-	N_{COV}, 90° plies for cover being analyzed, initially the valves in EL(3) for upper, EL(6) for lower.
4	-	ℓ_O, 0° plies for the opposite cover to the one being analyzed, value in EL(4) for the upper cover pass and the final upper cover value in TF(1) for the lower cover pass, used to compute the cover thickness value in location 11, TFCOV(2).
5	-	M_O, $\pm 45^\circ$ ply sets corresponding to the foregoing ℓ_O.
6	-	N_O, 90° plies corresponding to the foregoing ℓ_O.
7	CNX	N_x, cover compression load of current load condition, from STRESS (1 or 2, STA_i, $LOAD_i$), lb/in.

TABLE 209. TF ARRAY (CONT)

Array Location	Variable Name	Description
8	CRHØ	ρ_{core}, core density, lb/cu in. Initially set up as input density from SPB(12-22), adjusted as required if analysis option specifies optimization of core requirements.
9	HML	D_{TB}, average torque-box depth, in.
Locations 10 through 40, except 31 and 32, contain the analysis variables that are computed and used by CKSFDH. Data in locations 31 and 32 are computed and used by ACWFDH.		
10	TFCØV(1)	t_{COV}, skin thickness of the cover being analyzed, in.
11	TFCØV(2)	t_o, skin thickness of the opposite cover to the one being analyzed, in.
12	E11	$(E_x)_{lam}$, laminate elastic modulus based on the plate rigidity parameter D_{11} (Section II, Equation 109), psi.
13	E22	$(E_y)_{lam}$, laminate elastic modulus based on the plate rigidity parameter D_{22} (Section II, Equation 109), psi.
14	EB	E_B, cover elastic modulus term for allwable core wrinkling stress equation (Section II, Equation 109), psi.
15	CEP	E_c', core compression modulus for CRHØ, psi.
16	CGP	G_c', core shear modulus for CRHØ, psi.
17	FCW	f_{cw}, allowable core wrinkling stress, psi.
18	CRWNX	$(N_x)_{cw\ allow}$, allowable core wrinkling load, based on CRHØ, lb/in.
19	PCRUSH	P_c, core crushing load, pounds per inch span per in. width.
20	PCRUA	$(P_c)_{allow}$, allowable core crushing load, based on CRHØ, lb/in./in.
21	RCW	R_{cw}, ratio of applied to allowable core wrinkling loads, $((N_x)/(N_x)_{cw\ allow})$
22	RCC	R_c, ratio of applied to allowable core crushing loads, $(P_c/(P_c)_{allow})$
23	RHØCW	ρ_{cw}', required core density to prevent core wrinkling for given applied load and skin configuration, lb/cu in.
24	RHØCC	ρ_{cc}', required core density to prevent core crushing for given applied load and skin configuration, lb/cu in.
25	HC	D', effective core depth, $D_{TB}-t_i-t_o$, in.
26	-	ρ'/ρ_f, ratio of initial core density to core foil density
27	-	$(\rho'/\rho_f)_c$, ratio of calculated core density to core foil density.

TABLE 209. TF ARRAY (CONCL)

Array Location	Variable Name	Description
28	CRNXCP	$(N_x)_{cr}$, allowable core wrinkling load based on RHØMAX, to be used by ACWFDH for variable core density analysis, lb/in.
29	CRPCCP	$(P_c)_{cr}$, allowable core crushing load based on RHØMAX, to be used by ACWFDH for variable core density analysis, lb/in./in.
30	RHØMAX	$(\rho_c)_{max}$, core density required to satisfy conditions for core wrinkling, core crushing and minimum input density for the given load and skin configuration, maximum of RHØCW, RHØCC and CRHØ, to be used by ACWFDH during the core density/cover laminate analysis options for a) variable core density for initial skin ply set or b) optimum core/cover configuration, lb/cu in.
31	-	$(W)_{i-1}$, weight of skin plus core for last skin ply set, $(\rho t_{i-1} + \rho core_{\ i-1}\ HC)$, computed by ACWFDH during optimum core/cover configuration search, lb/sq in.
32	-	$(W)_i$, weight of skin plus core for current skin ply set, same as the foregoing $(W)_{i-1}$.
33	-	E_c', core compression modulus for RHØMAX, psi.
34	-	G_c', core shear modulus for RHØMAX, psi.
35-40	-	Not used.

TABLE 210. W ARRAY, SUBROUTINE WEIGH1

General information for array W:

Reference location: Subroutine WEIGH1

Array size = 30 cells

Array W contains thickness, area and weight data for the torque box structural components at the current analysis control station. The information is computed by subroutine WEIGH1 from design data resulting from the multispar or fulldepth honeycomb sandwich analysis of subroutine ACWMS. Array locations are initialized to 0.0 values before computations are made. Subroutine WEIGH1 prints the contents of array W under control of the analysis station print control array APRTID, locations 1-11.

Array Location	Description
1	$(W_{skin})_{upr}$, upper cover skin weight, including front and rear spar overhang material, lb/in.
2	$(W_{skin})_{lwr}$, lower cover skin weight, including front and rear spar overhang material, lb/in.
3	$(W_{web})_{FS}$, front spar web weight, lb/in.
4	$(W_{web})_{IS}$, total weight of intermediate spar webs for multispar design, total core weight for fulldepth honeycomb sandwich design, lb/in.
5	$(W_{web})_{RS}$, rear spar web weight, lb/in.
6	$(W_{misc})_{upr}$, weight of nonstructural items for the upper cover; exterior flame spray and interior protective finish for multispar/plate design and plus honeycomb core and bond for multispar/honeycomb panel design; exterior flame spray only for fulldepth honeycomb sandwich design, lb/in.
7	$(W_{misc})_{lwr}$, same as location 6 except for lower cover.
8	$(W_{misc})_{FS}$, weight of nonstructural items for the front spar web; protective finish for corrugated webs, plus core and bond for honeycomb panel design, lb/in.
9	$(W_{misc})_{IS}$, total weight of intermediate spar nonstructural items for multispar designs only, 0.0 for fulldepth honeycomb sandwich designs, lb/in. Protective finish only for corrugated webs, plus core and bond for honeycomb panel design.
10	$(W_{misc})_{RS}$, same as location 8, except for rear spar.
11	$(W_{CU})_{FS}$, weight of front spar upper cap, including insert weight if multispar honeycomb panel design, lb/in.
12	$(W_{CL})_{FS}$, weight of front spar lower cap, including insert weight if multispar honeycomb panel design, lb/in.
13	$(W_{CU})_{RS}$, weight of rear spar upper cap, including insert weight if multispar honeycomb panel design, lb/in.

TABLE 210. W ARRAY, SUBROUTINE WEIGHT (CONCL)

Array Location	Description
14	$(W_{CL})_{RS}$, weight of rear spar lower cap, including insert weight if multispar honeycomb panel design, lb/in.
15	$(W_C)_{IS}$, total weight of intermediate spar caps, including insert weights if multispar honeycomb panel design; total bond weight if fulldepth honeycomb sandwich design, lb/in.
16	W_{MISC}, total weight of miscellaneous items for front, rear and intermediate spars, computed as a fraction of the weights of these structures, except for cover to intermediate spar attachments, lb/in.
17	N_{IS}, number of intermediate spars.
18	W_{eff}, effective torque-box width for cover material weight calculations, in.
19	Not used
20	Cap thickness term for caluclation of front and rear spar cap areas in.
21	$(t_{fill})_{upr}$, upper cover filler material thickness, added material required in upper cover along cover to intermediate spar attach line, multispar design only, 0.0 for full depth honeycomb sandwich design, in.
22	$(t_{fill})_{lwr}$, lower cover filler material, same as previously defined for upper cover.
23	$(W_{fill})_{upr}$, total weight of upper cover filler material, lb/in.
24	$(W_{fill})_{lwr}$, total weight of lower cover filler material, lb/in.
25	$(W_{att})_{upr}$, total weight of upper cover to intermediate spar attachments, lb/in.
26	$(W_{att})_{lwr}$, total weight of lower cover to intermediate spar attachments, lb/in.
27	$(L_{att})_{upr}$, effective length of each upper cover to intermediate spar fastener for weight calculation, 0.0 for fulldepth honeycomb sandwich design, in.
28	$(L_{att})_{lwr}$, effective length of each lower cover to intermediate spar fastener for weight calculation, 0.0 for fulldepth honeycomb sandwich design, in.
29-30	Not used.

TABLE 211. TX ARRAY

General information for array TX:

Blank common reference location = CD (1)

Array size = 160 cells

Array TX contains cover analysis data for the current assumed value of skin l-ply. This array is used as the basic data storage and retrieved retrieval source by subroutines ACWSTR, ACMRSK, and ACSTRG. Selected data items from this array are printed by ACMRSK and ACSTRG under control of analysis station print control array APRTID, locations 1 through 11. Subroutine ACWSTR prints the complete contents of array TX at the conclusion of each l-ply synthesis pass, under control of APRTID(12).

Array Location	Variable Name	Description
Locations 1 through 29 contain data items computed by subroutine ACMRSK during the load distribution/skin stability analysis of the skin/stringer section. Computations by ACMRSK are based on a given combination of skin l-plies and stringer area as specified by subroutine ACWSTR. Data computed during the ACMRSK skin sizing loop reflect the set of skin l-, m-, and n plies that will result in skin stability due to skin N_X and N_{XY} loads only, without regard to lamina and stringer P/A compression or tension stresses. These stress conditions are examined in the second load evaluation loop. Results from this loop are examined by subroutine ACWSTR to determine if the assumed stringer area and skin are acceptable.		
1	EMI	M_{skin}, number of ±45° ply sets in the skin half-laminate that will prevent skin buckling under combined shear and compression or pure shear, initially set is EMØ + DLEMI and incremented as required.
2	ENI	N_{skin}, number of 90° plies in the skin half-laminate, initially computed as ENØ + DLENI and recomputed each time EMI is changed.
3	SKRMX	$(P_{sk}/P_{tot})_{max}$, maximum ratio of skin load to total load for all design load conditions.
4	TSK	t_{sk}, skin gage for current skin l-, m- and n-ply set, in.
5	ASKT	A_{skin}, area of skin for skin/stringer column, $t_{sk} \cdot b_s$, sq in.
6	ASKL	$(A_{skin})_1$, area of skin 0° plies for skin/stringer column, 2.0 t_L x l_{skin} x b_s, sq in.
7	ASTRL	LT_{str}, developed length of stringer, in.

TABLE 211. TX ARRAY (CONT)

Array Location	Variable Name	Description
8	RSKPØA	$(f_{skin}/f_{allow})_{1\ max}$, maximum ratio of skin 0° ply P/A stress to allowable 0° ply stress for all design load conditions.
9	RSTPØA	$(f_{str}/f_{allow})_{1\ max}$, maximum ratio of stringer 0° ply P/A stress to allowable 0° ply stress for all design load conditions.
10	RAE	AE ratio for skin and stringer sections, $(AE)_{skin}/(AE)_{str}$.
11	DLEMI	Δm_{skin}, incremental number of ±45° ply sets in the skin half-laminate necessary to prevent skin buckling, computed as EMI-EMØ, initial value specified by ACWSTR, final value calculated by ACMRSK.
12	DLENI	Δn_{skin}, incremental number of 90° plies corresponding to Δm_{skin}.
13	ESKCRL	$(E_{skin})_{cr}$, effective elastic modulus of skin for the load condition producing the maximum skin load if the skin is not stability critical.
14	PSKCRL	$(P_{skin})_{cr}$, maximum axial load in skin, lb.
15	PSTCRL	$(P_{str})_{cr}$, stringer load for the design condition specified for $(P_{skin})_{cr}$, lb.
16	PNXCRL	$(N_X)_{cr\ skin}$, maximum skin N_X load corresponding to $(P_{skin})_{cr}$, lb/in.
17	QSKCRL	$(N_{XY})_{cr}$, skin shear load at the critical load condition, lb/in.
18	PCCRI	$(N_X)_{allow}$, allowable skin compression load, computed value for each load condition, lb/in.
19	PSCRI	$(N_{XY})_{allow}$, allowable skin shear load, computed value for each load condition, lb/in.
20	RMAX	R_{max}, maximum value of interaction ratios for all design load conditions.
21	RI	R_i, interaction ratio computed for each design load condition, $R_c + R_s^2$.
22	RCI	R_c, ratio of applied skin load to allowable skin load for each design load condition.
23	RSI	R_s, ratio of applied skin shear load to allowable skin shear load for each design load condition.
24	FCI	P_{tot}, total load on skin/stringer column for each design load condition, $N_X \cdot b_s$, lb.

TABLE 211. TX ARRAY (CONT)

Array Location	Variable Name	Description
25	PNXI	$(N_X)_{skin}$, skin load resulting from load distribution calculations, initially total cover load, lb/in.
26	PNXYI	$(N_{XY})_{skin}$, cover shear load, lb/in.
27	RASKI	$(f_{skin}/f_{allow})_{1\ skin}$, ratio of skin 0° ply P/A stress to allowable 0° ply stress.
28	RASTI	$(f_{str}/f_{allow})_{1\ str}$, ratio of stringer 0° ply P/A stress to allowable 0° ply stress.
29	EØØ	E_{skin}, effective elastic modulus of skin, $[E_{11}-E_{12}{}^2/E_{22}]$.
Locations 30 through 80 contain data items computed during the skin/stringer section optimization analysis for assumed values of skin 1-plies.		
30	BS	b_s, stringer spacing for current analysis station, specified by subroutine ACWRBS as variable B, in.
31	WIDE	W_{TB}, torque-box width for current analysis station, specified by subroutine ACWRBS, in.
32	ELL	l_{st}, number of 0° plies in cover half-laminate for basic P/A as computed by subroutine ACWRBS, setup by ACWSTR from EL(1) for upper cover, EL(4) for lower cover.
33	ELØ	$(l_{skin})_o$, number of 0° plies in skin half-laminate, current analysis pass value.
34	EMØ	$(m_{skin})_o$, number of ±45° ply sets in skin half-laminate for basic P/A as computed by subroutine ACWRBS, setup by ACWSTR from EL(2) for upper cover and EL(5) for lower cover.
35	ENØ	$(n_{skin})_o$, initial value for number of 90° plies in skin half laminate compatible with variables ELL and EMØ.
36	ELSK	l_{skin}, final design value for number of 0° plies in skin half-laminate.
37	EMSK	m_{skin}, final design value for number of ±45° ply sets in skin half-laminate.
38	ENSK	n_{skin}, final design value for number of 90° plies in skin half-laminate.
39	DELL	Δl_{skin}, difference between the number of initial 0° plies required for cover P/A requirements and number of 0° plies in the skin for the current analysis pass, i.e., (ELL-ELØ), used to determine available 0° ply area for stringers.

TABLE 211. TX ARRAY (CONT)

Array Location	Variable Name	Description
40	ASTRA	$(A_{str})_{avail}$, available 0° ply area for stringer, computed as DELL • BS, sq in.
41	SKMNL	$(1_{skin})_{min}$, minimum number of 0° plies in current cover skin half laminate, starting value for skin 1-ply analysis (absolute minimum value = 1.0).
42	DLSK1	1_{skin}, current value of skin 1-ply increment to be used during skin 1-ply search, set to 4.0 first for initial convergence to the optimum and then changed to 2.0 or 1.0 for selection of the true optimum number of skin 1-plies.
43	SKLUMN	Initial estimate for minimum number of 0° plies for upper cover skin half-laminate based on 1) final design data for previous stringer spacing and analysis station and 2) minimum specified as input.
44	SKLLMN	Initial estimate for minimum number of 0° plies for lower cover skin half-laminate, computed as described for variable SKLUMN.
45	STRLUM	Initial estimate for minimum number of 0° plies for upper cover stringers, similar to computations for variables SKLUMN and SKLLMN.
46	STRLLM	Initial estimate for minimum number of 0° plies for lower cover stringer, similar to STRLUM.
47	BRIBR	$(L_{rib}/L_{rib\ max})$, ratio of allowable rib spacing to maximum spacing.
48	DLSTRL	$\Delta 1_{str}$, current value of stringer 1-ply increment to be used during stringer area search, initially set to 16.0 or to the starting number of stringer 1-plies if larger, for initial convergence computations. This value is reduced by halves after an acceptable stringer 1-ply value is determined until a value of 4.0 is obtained.
49	ASTRØ	$(A_{str})_{min}$, minimum stringer area, based on minimum gage and size, sq in.
50	STRLØ	$(1_{str})_{min}$, minimum number of 0° plies in stringer.
51	STRLTØ	$(LT_{str})_{min}$, minimum developed length of stringer, in.
52	BRIBMN	$(L_{rib})_{min}$, minimum required rib spacing, in.
53	BRIBMX	$(L_{rib})_{max}$, maximum required rib spacing, in.
54	BRIB	L_{rib}, allowable rib spacing, in.
55	ASTR	A_{str}, stringer area for current analysis, sq in.
56	STRL	1_{str}, number of stringer 0° plies for current analysis.

TABLE 211. TX ARRAY (CONT)

Array Location	Variable Name	Description
57	STRLT	LT_{str}, developed length of stringer for current analysis, in.
58	AESTR	$(A \cdot E)_{str}$, product of stringer area and stringer elastic modulus for loading condition critical for column length, compatible with L_{rib}, lb.
59	TBSTR	$\bar{t}_{str}$, equivalent gage for stringer, A_{str}/BS, in.
60	TSTR	t_{str}, stringer gage, in.
61	FSTR	$(f_c)_{str}$, maximum applied compression stress in stringer, computed by subroutine ACMRSK, psi.
62	BW	h_{str}, stringer web height, in.
63	BF	f_{str}, stringer flange width, in.
64	ISTR	$(I_o)_{str}$, stringer area moment of inertia about its centroid, $in.^4$
65	YBAR	$\bar{Y}_{str}$, stringer centroid, distance from inner surface of skin, in.
66	YPLATE	$(\bar{Y}_p)_{str}$, cover load centroid, distance from plane of symmetry of skin laminate, in.
67	TRIB	t_{rib}, rib web gage, in.
68	EIREQD	$(EI_{reqd})_{rib}$, rib stiffness required for skin/stringer column support, $lb\text{-}in^2$.
69	EIRIB	$(EI)_{rib}$, available rib stiffness for current design condition, $lb\text{-}in^2$.
70	ERIB	E_{rib}, elastic modulus for rib web laminate, psi.
71	TBTØT	$\bar{t}_{tot}$, equivalent gage for total cover and support material, sum of $\bar{t}$ for cover, rib and skin-to-rib attachments and skin filler material, in.
72	TBCØV	$\bar{t}_{cov}$, equivalent gage for cover material, sum of t_{skin} and $\bar{t}_{str}$, in.
73	TBRIB	$\bar{t}_{rib}$, equivalent gage for rib, sum of caps, web and protective finish, plus core and bond for honeycomb panel design, in.
74	TBFIL	$\bar{t}_{filler}$, equivalent gage for skin filler material required in skin laminate along skin-to-rib attachment lines, in.
75	TBATT	$\bar{t}_{att}$, equivalent gage for skin-to-rib attachments, in.
76	BWØTS	$(b/t)_w$, minimum allowable stringer web b/t.
77	BFØTS	$(b/t)_f$, minimum allowable stringer flange b/t.
78	BØTA	$(b/t)_w$, stringer web b/t.

TABLE 211. TX ARRAY (CONCL)

Array Location	Variable Name	Description
79	STFNT	Factor for stringer developed length equation to account for t_{str} effects at web-to-flange intersections, function of stringer type. Values are 0.0 for "I," 1.0 for "Z," 1.0 for "T" and 2.0 for hat.
80	TSTRØ	$(t_{str})_{min}$, minimum stringer gage, in.
Locations 81 through 160 contain four 20-cell subarrays, ESK, PSK, PSTR and SKR calculated by subroutine ACMRSK.		
81-100	ESK(1-20)	E_{skin} (1-20), skin elastic modulus for the 20 design load conditions, psi.
101-120	PSK(1-20)	P_{skin} (1-20), skin load for each individual skin/stringer column for the 20 design load conditions, lb/column.
121-140	PSTR (1-20)	P_{str} (1-20), stringer load for each individual skin/stringer column for the 20 design load conditions, lb/column.
141-160	SKR(1-20)	R_{skin} (1-20), skin load ratio for the 20 design load conditions.

TABLE 212. TXS ARRAY

General information for array TXS:

Blank common reference location = CD(161)

Array size = 100 cells

Array TXS contains two types of data sets. The first set consists of pertinent design information resulting from the current synthesis pass for multirib designs. The data are created and used by subroutine ACWSTR during the search logic for selection of the optimum design for the stringer spacing specified by subroutine ACWRBS at the current analysis control station. The second set is used by subroutine ACSTRG for storage and retrieval of stringer geometry information. Data from this set, along with other stringer section data are printed by ACSTRG under control of analysis station print control array APRTID, locations 1-11. Subroutine ACWSTR prints the complete contents of array TXS at the conclusion of each synthesis pass for each assumed skin l-ply value, under control of location 12 of array APRTID.

Array Location	Variable Name	Description
Locations 1 through 29 contain the data set created and used by subroutine ACWSTR. The data set in locations 1-10, 23 and 24 is initialized first from the results of the first synthesis pass. If more than two skin ℓ-ply synthesis passes are required, data in this set are replaced by the current ℓ-ply results if the total weight slope dictates additional passes with increase value for skin ℓ-plies, i.e., $(\Sigma \bar{t}_j < \Sigma \bar{t}_{j-1})$. This data set is used during the separate analysis for the upper cover and lower cover.		
1	-	$\Sigma\bar{t}$, sum of current cover $\bar{t}_{cov}$, $\bar{t}_{rib}$, $\bar{t}_{filler}$, and $\bar{t}_{att.}$, in.
2	-	ℓ_{sk}, number of 0° plies in skin half-laminate.
3	-	m_{sk}, number of ±45° ply sets in skin half-laminate.
4	-	n_{sk}, number of 90° plies in skin half-laminate.
5	-	t_{sk}, skin gage, in.
6	-	A_{str}, stringer area, sq. in.
7	-	ℓ_{str}, number of 0° plies in stringer.
8	-	LT_{str}, developed length of stringer, (A_{str}/t_{str}), in.
9	-	t_{str}, stringer gage, in.
10	-	L_{rib}, rib spacing, in.

TABLE 212. TXS ARRAY (CONT)

Array Location	Variable Name	Description
The data set in location 11 through 15, and 21 contain final upper cover design values for the specified stringer spacing of the current analysis station. Data in this set is used in the selection of the initial search value for upper cover skin ℓ-ply and stringer ℓ-ply for the next analysis control station.		
11	-	$(\ell_{st})_{upr}$, total number of 0° plies required for P/A requirements in upper cover half-laminate, the initial value in EL(1).
12	-	$(\ell_{sk})_{upr}$, number of 0° plies in upper cover skin half-laminate.
12	-	
13	-	$(\ell_{str})_{upr}$, number of 0° plies in upper cover stringer.
14	-	$(A_{str})_{upr}$, upper cover stringer area, sq. in.
15	-	$(LT_{str})_{upr}$, upper cover stringer developed length, in.
The data set in locations 16 through 20 and 22 contain final lower cover design values to be used as previously described for the upper cover.		
16	-	$(\ell_{st})_{lwr}$
17	-	$(\ell_{sk})_{lwr}$
18	-	$(\ell_{str})_{lwr}$
19	--	$(A_{str})_{lwr}$
20	--	$(LT_{str})_{lwr}$
21	-	$(\Delta m_{sk})_{upr}$, incremental number of ±45° ply sets added to the initial value of upper cover half-laminate m-plies in EL(2).
22	-	$(\Delta m_{sk})_{lwr}$
23	-	$(\Delta M_{sk}$, incremental number of ±45° ply sets added to the initial m-ply value for the cover and synthesis pass corresponding to the set in locations 1 through 10.
24	-	Δn_{sk} incremental number of 90° plies corresponding to Δm_{sk} in location 23.
25-29	-	Not used.
Locations 30 through 40 contain data computed by subroutine ACSTRG. Locations 41 through 100 are not used.		

TABLE 212. TXS ARRAY (CONCL)

Array Location	Variable Name	Description
30	BWL	L_{str}, number of 0^{o} plies in final stringer configuraiton
31	BWT	t_{str}, stringer thickness for final configuration, in.
32	BWLT	LT_{str}, stringer developed length for final configuration, in.
33	-	Not used.
34	-	Not used.
35	BWLI	$(L_{str})_i$, 0^{o} plies for second stringer geometry.
36	BWTI	$(t_{str})_i$, stringer thickness for BWLI, in.
37	BWLTI	$(LT_{str})_i$, stringer developed length for BWLI, in.
38	BWI	$(h_{str})_i$, stringer web height for BWLI, in.
39	BFI	$(f_{str})_i$, stringer flange width for BWLI, in.
40	BØTF	$(b/t)_f$, stringer flange b/t.
41-100	-	Not used.

TABLE 213. STRING ARRAY

General information for array STRING:

Blank common reference location = T(1676)

Array size = 220 cells

Array dimension = (2,10,11)

Array STRING contains upper and lower design data for multirib designs to supplement the ply data stored in array IEL. Array locations are used initially to store current synthesis pass data resulting from the analysis under control of subroutine ACWSTR. This array is also used to store final design data to be used for stiffness and weight analysis. The design information stored in STRING reflect sizing data necessary to satisfy strength and stability requirements only. The i-index of the (i,j,k) array dimension refers to the upper cover, i = 1, and lower cover, i = 2, except as noted. The cover design parameters are referenced by the j-index. These are stored in data sets for each of the 11 structural synthesis control stations identified by the k-index.

Relative Core Location	Array Index Value	Description
1	1,1,1	b_{str}, stringer spacing for upper cover, station 1, in. (lower cover spacing is assumed to be the same.)
2	2,1,1	$(f_{st})_{upr}$, critical stress, upper cover stringer, station 1, psi
3	1,2,1	b_{rib}, intermediate rib spacing based on upper cover design, station 1, in.
4	2,2,1	$(f_{st})_{lwr}$, critical stress, lower cover stringer, station 1, psi
5	1,3,1	$(\bar{Y}_p)_{upr}$, distance between the total load centroid plane and the skin load plane for upper cover, station 1, in.
6	2,3,1	$(\bar{Y}_p)_{lwr}$, distance between the total load centroid plane and the skin load plane for lower cover, station 1, psi.
7	1,4,1	$(I_{str})_{upr}$, upper cover stringer section area moment of inertia about the stringer section centroid, station 1, in^4.

TABLE 213. STRING ARRAY (CONT)

Relative Core Location	Array Index Value	Description
8	2,4,1	$(I_{str})_{lwr}$, lower cover stringer section area moment of inertia about the stringer section centroid, station 1, in^4.
9	1,5,1	$(\bar{Y}_{str})_{upr}$, distance between the stringer section centroid and the inner surface of the skin, upper cover, station 1, in.
10	2,5,1	$(\bar{Y}_{str})_{lwr}$, distance between the stringer section centroid and the inner surface of the skin, lower cover, station 1, in.
11	1,6,1	$(b_w)_{upr}$, upper cover stringer web height, station 1, in.
12	2,6,1	$(b_w)_{lwr}$, lower cover stringer web height, station 1, in.
13	1,7,1	$(b_f)_{upr}$, upper cover stringer flange width, station 1, in.
14	2,7,1	$(b_f)_{lwr}$, lower cover stringer flange width, station 2, in.
15	1,8,1	$(t_{str})_{upr}$, upper cover stringer gage, station 1, in.
16	2,8,1	$(t_{str})_{lwr}$, lower cover stringer gage, station 1, in.
17	1,9,1	$(A_{str})_{upr}$, upper cover stringer area, station 1, sq. in.
18	2,9,1	$(A_{str})_{lwr}$, lower cover stringer area, station 1, sq. in.
19	1,10,1	$(l_{str})_{upr}$, number of 0° ply layers in the upper cover stringer, station 1.
20	2,10,1	$(l_{str})_{lwr}$, number of 0° ply layers in the lower cover stringer, station 1.
21-40	(1-2),(1-10),2	Cover design data, station 2.
41-60	(1-2),(1-10),3	Cover design data, station 3.
61-80	(1-2),(1-10),4	Cover design data, station 4.

TABLE 213. STRING ARRAY (CONCL)

Relative Core Location	Array Index Value	Description
81-100	(1-2),(1-10),5	Cover design data, station 5.
101-120	(1-2),(1-10),6	Cover design data, station 6.
121-140	(1-2),(1-10),7	Cover design data, station 7.
141-160	(1-2),(1-10),8	Cover design data, station 8.
161-180	(1-2),(1-10),9	Cover design data, station 9.
181-200	(1-2),(1-10),10	Cover design data, station 10.
201-220	(1-2),(1-10),11	Cover design data, station 11.

TABLE 214. W ARRAY, SUBROUTINE WEIGH2

General information for array W:

Reference location: Subroutine WEIGH2

Array size = 35 cells

Array W contains thickness, area, and weight data for multirib torque-box structural components at the current analysis control station. The information is computed by subroutine WEIGH2 from design data resulting from the multirib analysis under the control of subroutine ACWRBS. The array locations are initialized to 0.0 values before computations are made. Subroutine WEIGH2 prints the contents of array W under control of analysis station print control array APRTID, locations 1-11.

Array Location	Description
1	$(W_{skin})_{upr}$, upper cover skin weight, including front end rear spar overhang material, lb/in.
2	$(W_{skin})_{lwr}$, lower cover skin weight, including front end rear spar overhang material, lb/in.
3	$(W_{web})_{FS}$, front spar web weight, lb/in.
4	$(W_{web})_{IR}$, total weight of intermediate rib webs, lb/in.
5	$(W_{web})_{RS}$, rear spar web weight, lb/in.
6	$(W_{misc})_{upr}$, weight of upper cover skin exterior flame spray and interior protective finish material, lb/in.
7	$(W_{misc})_{lwr}$, weight of lower cover skin exterior flame spray and interior protective finish material, lb/in.
8	$(W_{misc})_{FS}$, weight of nonstructural items for front spar web, protective finish for corrugated web, plus core and bond for honeycomb panel design, lb/in.
9	$(W_{misc})_{IR}$, total weight of nonstructural items for intermediate rib webs, protective finish for corrugated webs, plus core and bond for honeycomb panel design lb/in.
10	$(W_{misc})_{RS}$, weight of nonstructural items for rear spar web, protective finish for corrugated web, plus core and bond for honeycomb panel design, lb/in.
11	$(W_{CU})_{FS}$, weight of front spar upper cap, lb/in.
12	$(W_{CL})_{FS}$, weight of front spar lower cap, lb/in.
13	$(W_{CU})_{RS}$, weight of rear spar upper cap, lb/in.
14	$(W_{CL})_{RS}$, weight of rear spar lower cap, lb/in.
15	$(W_{str})_{upr}$, total weight of upper cover stringers, lb/in.
16	W_{misc}, total weight of miscellaneous items for front spar, rear spar and intermediate ribs, computed as a fraction of the weight of these structures, except for cover to rib attachments, lb/in.

TABLE 214. W ARRAY, SUBROUTINE WEIGH2 (CONCL)

Array Location	Description
17	$(W_{str})_{lwr}$, total weight of lower cover stringers, lb/in.
18	W_{eff}, effective torque-box width for skin material weight calculations, in.
19	$\bar{t}_{upr}$, equivalent thickness of upper cover material, in.
20	$\bar{t}_{lwr}$, equivalent thickness of lower cover material, in.
21	$(W_{misc})_{str\ upr}$, total weight of protective finish material for upper cover stringers, lb/in.
22	$(W_{misc})_{str\ lwr}$, total weight of protective finish material for lower cover stringers, lb/in.
23	Not used.
24	Not used.
25	Temporary storage. Initially cap thickness term for calculation of front and rear spar cap areas, in. Rib spacing for filler and attachment weight calculations, in. Rib weight term for intermediate rib weight calculations, in.
26	$(t_{fill})_{upr}$, upper cover filler material thickness, added material required in upper cover along skin to intermediate rib attach line, in.
27	$(t_{fill})_{lwr}$, lower cover filler material, in.
28	$(W_{fill})_{upr}$, total weight of upper cover filler material, lb/in.
29	$(W_{fill})_{lwr}$, total weight of lower cover filler material, lb/in.
30	$(W_{att})_{upr}$, total weight of upper cover to intermediate rib attachments, lb/in.
31	$(W_{att})_{lwr}$, total weight of lower cover to intermediate rib attachments, lb/in.
32	$(L_{att})_{upr}$, effective length of each upper cover to intermediate rib fastener for weight calculations, in.
33	$(L_{att})_{lwr}$, effective length of each lower cover to intermediate rib fastener for weight calculations, in.
34	$(W_{cap})_{IR}$, total weight of intermediate rib caps, lb/in.
35	Not used.

TABLE 215. TSF ARRAY

General information for array TSF:

Blank common reference location = CD(441)

Array Size = 60 cells

Array TFS contains torque-box stiffness calculation data created by subroutine ASTIFF. The information consists of detail cross-sectional geometry properties of those elements of the torque-box affecting the bending and torsional stiffness characteristics at each analysis station. The information is used by subroutine ACEIGJ to compute EI, GJ, E and G values at analysis temperatures specified in array TEIGJ. The contents of array TSF is printed under control of analysis station print control array APRTID, locations 1 through 11. Array TSF is initialized to 0.0 values by subroutine ASTIFF before calculation of stiffness data for each of the 11 analysis control stations.

Array Location	Description
1	$(\bar{t}_{cov})_{upr}$, upper cover equivalent thickness, in.
2	$(\bar{t}_{cov})_{lwr}$, lower cover equivalent thickness, in.
3	$(t_{cap})_{upr}$, for multispar design, $(\bar{t}_{str})_{upr}$, for multirib design, 0.0 for full-depth honeycomb sandwich design, in.
4	$(\bar{t}_{cap})_{lwr}$, for multispar design, $(\bar{t}_{str})_{lwr}$, for multirib design, 0.0 for full depth honeycomb sandwich design, in.
5	$(I_o)_{cap\ upr}$, area moment of inertia for thickness in location 3, in^4/in.
6	$(I_o)_{cap\ lwr}$, area moment of inertia for thickness in location 4, in^4/in.
7	$(\bar{Y}_{cap})_{upr}$, centroid of upper cover intermediate spar cap or stringer defined by thickness in location 3, distance from inner surface of skin, in.
8	$(\bar{Y}_{cap})_{lwr}$, centroid of lower cover intermediate spar cap or stringer defined by thickness in location 4, distance from inner surface of skin, in.
9	K_{nos}, factor for cap t-bar, number of elements divided by the sum of 1.0 plus the number of elements for multispar design; 1.0 for multirib design.
10	NOS, number of intermediate spars for multispar design.
11	Calculation code for subroutine ACEIGJ processing of array TA data from data in array TSF. Code value of 0.0 indicates calculations to be made, 1.0 indicates no calculations.

TABLE 215. TSF ARRAY (CONT)

Array Location	Description
12	D'_{eff}, average torque-box height, distance between the skin centroids, including honeycomb core thickness if multispar honeycomb panel cover design, in.
13	W_{eff}, effective width of torque-box section, distance between the centroids of the front spar and rear spar webs, including honeycomb core if honeycomb panel web design, in.
14	$(ds)_{upr}$, web width for upper cover skin, in.
15	$(ds)_{lwr}$, web width for lower cover skin, in.
16	$(ds)_{FS}$, web width for front spar web, in.
17	$(ds)_{RS}$, web width for rear spar web, in.
18	$(t_{skin})_{upr}$, upper cover skin thickness, in.
19	$(t_{skin})_{lwr}$, lower cover skin thickness, in.
20	$(t_{web})_{FS}$, front spar web thickness, in.
21	$(t_{web})_{RS}$, rear spar web thickness, in.
22	$(t_{core})_{upr}$, upper cover honeycomb core thickness if multispar honeycomb panel design, 0.0 for other designs, in.
23	$(t_{core})_{lwr}$, lower cover honeycomb core thickness if multispar honeycomb panel design, 0.0 for other designs, in.
24	$(t_{core})_{FS}$, front spar honeycomb core thickness if honeycomb panel design, 0.0 for corrugated web design, in.
25	$(t_{core})_{RS}$, rear spar honeycomb core thickness if honeycomb panel design, 0.0 for corrugated web design, in.
26	$(\bar{Y}_{skin})_{upr}$, centroid of upper cover skin, distance from outer surface of skin, in.
27	$(\bar{Y}_{skin})_{lwr}$, centroid of lower cover skin, distance from outer surface of skin, in.
28	$0.5\ [(t_{web})_{FS} + (t_{web})_{RS} + (t_{core})_{FS} + (t_{core})_{RS}]$, in.
29	$(A_{cap})_{FS\ upr}$, upper front spar cap area, sq in.
30	$(A_{cap})_{FS\ lwr}$, lower front spar cap area, sq in.
31	$(A_{cap})_{RS\ upr}$, upper rear spar cap area, sq in.
32	$(A_{cap})_{RS\ lwr}$, lower rear spar cap area, sq in.
33	$(\bar{Y}_{cap})_{FS\ upr}$, centroid of upper front spar cap, distance from inner surface of upper skin, in.
34	$(\bar{Y}_{cap})_{FS\ lwr}$, centroid of lower front spar cap, distance from inner surface of lower skin, in.
35	$(\Delta A_{cov})_{FS\ upr}$, upper cover overhang area at front spar, sq in.
36	$(\Delta A_{cov})_{FS\ lwr}$, lower cover overhang area at front spar, sq in.
37	$(\Delta A_{cov})_{RS\ upr}$, upper cover overhang area at rear spar, sq in.
38	$(\Delta A_{cov})_{RS\ lwr}$, lower cover overhang area at rear spar, sq in.

TABLE 215. TSF ARRAY (CONT)

Array Location	Description
39	$(\bar{Y}_{cap})_{RS\ upr}$, centroid of upper rear spar cap, distance from inner surface of upper skin, in.
40	$(\bar{Y}_{cap})_{RS\ lwr}$, centroid of lower rear spar cap, distance from inner surface of lower skin, in.
41	$(I_o)_{\Delta cov\ FS\ upr}$, area moment of inertia for upper cover overhang material at front spar, in^4.
42	$(I_o)_{\Delta cov\ FS\ lwr}$, area moment of inertia for lower cover overhang material at front spar, in^4.
43	$(I_o)_{\Delta cov\ RS\ upr}$, area moment of inertia for upper cover overhang material at rear spar, in^4.
44	$(I_o)_{\Delta cov\ RS\ lwr}$, area moment of inertia for lower cover overhang material at rear spar, in^4.
45	$(I_o)_{cap\ FS\ upr}$, area moment of inertia for upper front spar cap, in^4.
46	$(I_o)_{cap\ FS\ lwr}$, area moment of inertia for lower front spar cap, in^4.
47	$(I_o)_{cap\ RS\ upr}$, area moment of inertia for upper rear spar cap, in^4.
48	$(I_o)_{cap\ RS\ lwr}$, area moment of inertia for lower rear spar cap, in^4.
Locations 49 through 60 contain flutter stiffness increment data created by subroutine ASTIFF and used by subroutine ACEIGJ for determination of m-plies in the four torque-box webs necessary to satisfy flutter torsional stiffness requirements. This data set is created only for torque-box sections that do not satisfy flutter stiffness criteria.	
49	$(\Sigma\Delta m_{skin})_{upr}$, number of ±45° ply sets to be added to upper skin half-laminate to increase torsional stiffness of torque-box section.
50	$(\Sigma\Delta m_{skin})_{lwr}$, number of ±45° ply sets to be added to lower skin half-laminate to increase torsional stiffness of torque-box section.
51	$(\Sigma\Delta m_{web})_{FS}$, number of ±45° ply sets to be added to front spar web half-laminate to increase torsional stiffness of torque-box section.
52	$(\Sigma\Delta m_{web})_{RS}$, number of ±45° ply sets to be added to rear spar web half-laminate to increase torsional stiffness of torque-box section.
53	$(\Delta t_{VF})_{upr}$, incremental thickness added to upper skin to increase torsional stiffness of torque-box section, in.

TABLE 215. TSF ARRAY (CONCL)

Array Location	Description
54	$(\Delta t_{VF})_{lwr}$, incremental thickness added to lower cover skin to increase torsional stiffness of torque-box section, in.
55	$(\Delta t_{VF})_{FS}$, incremental thickness added to front spar web to increase torsional stiffness of torque-box section, in.
56	$(\Delta t_{VF})_{RS}$, incremental thickness added to rear spar web to increase torsional stiffness of torque-box section, in.
57	$(\Sigma PLIES)_{upr}$, total number of plies in upper cover skin laminate.
58	$(\Sigma PLIES)_{lwr}$, total number of plies in lower cover skin laminate.
59	$(\Sigma PLIES)_{FS}$, total number of plies in front spar web laminate.
60	$(\Sigma PLIES)_{RS}$, total number of plies in rear spar web laminate.

TABLE 216. TA ARRAY

General information for array TA:

Blank common reference location = CD(401)

Array size = 40 cells

Array TA is used by subroutine ACEIGJ for storage and retrieval of torque-box stiffness data. Array data is created during each analysis pass by ACEIGJ under control of subroutine ASTIFF. Array TA is printed by subroutine ACEIGJ at the conclusion of each analysis pass under control of analysis station print control array APRTID, locations 1 through 11. The array locations are initially set to 0.0 values by subroutine ASTIFF before computations are made for each of the 11 analysis control stations.

Array Location	Description
1	ΣI_{sec}, area moment of inertia of the torque-box, in^4.
2	ΣJ_{sec}, polar moment of inertia of the torque-box, in^4.
3	I_{upr}, area moment of inertia of upper cover structures, in^4.
4	I_{lwr}, area moment of inertia of lower cover structures, in^4.
5	$(E_{skin})_{upr}$, elastic modulus for upper cover skin, psi.
6	$(E_{skin})_{lwr}$, elastic modulus for lower cover skin, psi.
7	$(G_{skin})_{upr}$, shear modulus for upper cover skin, psi.
8	$(G_{skin})_{lwr}$, shear modulus for lower cover skin, psi.
9	$(G_{web})_{FS}$, shear modulus for front spar web, psi.
10	$(G_{web})_{RS}$, shear modulus for rear spar web, psi.
11	$(A')^2$, square of effective torque-box cross-sectional area for GJ calculations, $(D''\cdot W'')^2$, in^4.
12	D'', effective depth for torque-box skins, distance between the centroids of cover skins, in.
13	W'', effective width of skin webs for GJ calculations, distance between the centroids of front spar and rear spar webs, in.
14	$(ds'')_{upr}$, web width of upper cover skin for GJ calculations, in.
15	$(ds'')_{lwr}$, web width of lower cover skin for GJ calculations, in.
16	$(ds'')_{FS}$, web width of front spar web for GJ calculations, in.
17	$(ds'')_{RS}$, web width of rear spar web for GJ calculations, in.
18	$(t_{skin})_{upr}$, upper cover skin thickness, in.
19	$(t_{skin})_{lwr}$, lower cover skin thickness, in.
20	$(t_{web})_{FS}$, front spar web thickness, in.
21	$(t_{web})_{RS}$, rear spar web thickness, in.
22	$(I_{skin})_{upr}$, area moment of inertia for upper cover skin, $(I_o)_{skin}$ + transfer term, in^4.
23	$(I_{skin})_{lwr}$, area moment of inertia for lower cover skin, $(I_o)_{skin}$ + transfer term, in^4.

TABLE 216. TA ARRAY (CONCL)

Array Location	Description
24	$(I_{caps})_{upr}$, area moment of inertia for upper cover intermediate spar caps or stringers, $(I_o)_{caps}$ + transfer term, in^4.
25	$(I_{caps})_{lwr}$, area moment of inertia for lower cover intermediate spar caps or stringers, $(I_o)_{caps}$ + transfer term, in^4.
26	$(I_{\Delta cov})_{FS\ upr}$, area moment of inertia for upper cover overhang material at front spar, $(I_o)_{\Delta cov}$ + transfer term, in^4.
27	$(I_{\Delta cov})_{FS\ lwr}$, area moment of inertia for lower cover overhang material at front spar, $(I_o)_{\Delta cov}$ + transfer term, in^4.
28	$(I_{\Delta cov})_{RS\ upr}$, area moment of inertia for upper cover overhang material at rear spar, $(I_o)_{\Delta cov}$ + transfer term, in^4.
29	$(I_{\Delta cov})_{RS\ lwr}$, area moment of inertia for lower cover overhang material at rear spar, $(I_o)_{\Delta cov}$ + transfer term, in^4.
30	$(I_{cap})_{FS\ upr}$, area moment of inertia for upper front spar cap, $(I_o)_{cap}$ + transfer term, in^4.
31	$(I_{cap})_{FS\ lwr}$, area moment of inertia for lower front spar cap, $(I_o)_{cap}$ + transfer term, in^4.
32	$(I_{cap})_{RS\ upr}$, area moment of inertia for upper rear spar cap, $(I_o)_{cap}$ + transfer term, in^4.
33	$(I_{cap})_{RS\ lwr}$, area moment of inertia for lower rear spar cap, $(I_o)_{cap}$ + transfer term, in^4.
34	$(\bar{Y}''_{skin})_{upr}$, centroid of upper cover skin, distance from outer surface of skin, same as TSF(26) for strength design, revised to account for added m-ply thicknesses for flutter design, in.
35	$(\bar{Y}''_{skin})_{lwr}$, centroid of lower cover skin, distance from outer surface of skin, same as TSF(27) for strength design, revised to account for added m-ply thicknesses for flutter design, in.
36	$0.5\ [(\Delta t_{VF})_{upr} + (\Delta t_{VF})_{lwr}]$, in.
37	$0.5\ [(\Delta t_{VF})_{FS} + (\Delta t_{VF})_{RS}]$, in.
38-40	Not used.

TABLE 217. CD ARRAY, LOCATIONS 1-400, STIFFNESS DATA ARRAYS

General information for torque-box stiffness arrays:

Blank common reference location: CD(1) = 4121, stiffness data arrays referenced to array CD

Array sizes: CD = 2000 cells, stiffness arrays = 11 cells

Locations 1 through 400 contains data sets describing the stiffness characteristics of the advanced composite torque-box. The torque-box stiffness parameters are computed for the 11 structural synthesis control stations. The values are stored in 11 consecutive cells which are identified by unique variable names. Data sets are computed for strength-only design and for combined requirements for strength and flutter stiffness, under control of subroutine ASTIFF. Locations 1-400 of array CD is initially set to 0.0 values by ASTIFF. Subroutine ASTIFF prints the CD array stiffness data block under control of print control code IPB. The stiffness data block for the current gross weight pass is saved on mass storage file 1, record 40, by subroutine ACNSTR. It is reinitialized from this source by subroutines ATBØPT or ACPRTA for use by ACPRTA and ACPRØG. Subroutine ACPRØG saves the data sets for each gross weight on mass storage file 1, records 13, 14 and 15 for use in overlay (17,0).

CD Array Location	Variable Name	Description
Locations 1 through 88 contain torque-box stiffness information evaluated at the design reference temperature specified in TEIGJ(1). The data set in locations 45 through 88, will be identical to that in locations 1 through 44 if flutter stiffness requirements are not evaluated or if the surface is not flutter critical.		
1-11	GJSTD(1-11)	$(GJ)_{st\ (1-11)}$, torsional stiffness at the 11 structural analysis control stations, based on structural requirements for strength and stability only, lb-in^2.
12-22	EISTD(1-11)	$(EI)_{st\ (1-11)}$, bending stiffness at the 11 structural analysis control stations, based on structural requirements for strength and stability only, lb/in^2.
23-33	GSTD(1-11)	$(G)_{st\ (1-11)}$, equivalent material shear modulus for the previous $(GJ)_{st}$, calculated as $[(GJ)_{st}/(J)_{st}]$, psi.

TABLE 217. CD ARRAY, LOCATIONS 1-400, STIFFNESS DATA ARRAYS (CONT)

CD Array Location	Variable Name	Description
34-44	ESTD(1-11)	$(E)_{st\ (1-11)}$, equivalent material elastic modulus for the previous $(EI)_{st}$, calculated as $[(EI)_{st}/(I)_{st}]$, psi.
45-55	GJCD(1-11)	$(GJ)_{comp\ (1-11)}$, torsional stiffness based on structural requirements for strength, stability and flutter stiffness, lb-in^2.
56-66	EICD(1-11)	$(EI)_{comp\ (1-11)}$, bending stiffness based on structural requirements for strength, stability and flutter stiffness, lb-in^2.
67-77	GCMD(1-11)	(G)comp (1-11), equivalent material shear modulus for the previous $(GJ)_{comp}$, psi.
78-88	ECMD(1-11)	$(E)_{comp\ (1-11)}$, equivalent material elastic modulus for the previous $(EI)_{comp}$, psi.
Locations 89 through 132 contain torque-box stiffness information for flutter design evaluated at the design temperature specified in TEIGJ(2). This data set will contain 0.0 values if the flutter stiffness analysis option is not selected, variable VFID = 0.0 (input data D(251)). The stiffness data for strength and stability design only for this set is stored in locations 353 through 396.		
89-99	GJVFD(1-11)	$(GJ)_{comp\ VF\ (1-11)}$, torsional stiffness based on structural requirements for strength, stability and flutter stiffness, evaluated at the design temperature for flutter analysis, lb-in^2.
100-110	EIVFD(1-11)	$(EI)_{comp\ VF\ (1-11)}$, bending stiffness based on structural requirements for strength, stability and flutter stiffness, evaluated at the design temperature for flutter analysis, lb-in^2.
111-121	GVFD (1-11)	$(G)_{comp\ VF\ (1-11)}$, equivalent material shear modulus for the previous $(GJ)_{VF}$, psi.

TABLE 217. CD ARRAY, LOCATIONS 1-400, STIFFNESS DATA ARRAYS (CONT)

CD Array Location	Variable Name	Description
122-132	EVFD(1-11)	$(E)_{comp\ VF\ (1-11)}$, equivalent material elastic modulus for the previous $(EI)_{VF}$, psi
Locations 133 through 220 contain torque-box stiffness information identical to that in locations 1-88 but based on the evaluation temperature specified in TEIGJ(3), design temperature for flutter optimization. This data set will contain 0.0 values if the flutter optimization design data output option is not selected, variable DINID = 0.0 or 2.0. The data set in locations 177 through 220 will be identical to that in 133 through 176 if flutter stiffness requirements are not evaluated or if the surface is not flutter critical.		
133-143	GJSFØ(1-11)	$(GJ)_{st}$ FØ (1-11)
144-154	EISFØ(1-11)	$(EI)_{st}$ FØ (1-11)
155-165	GSFØ(1-11)	$(G)_{st}$ FØ (1-11)
166-176	ESFØ(1-11)	$(E)_{st}$ FØ (1-11)
177-187	GJCFØ(1-11)	$(GJ)_{comp}$ FØ (1-11)
188-198	EICFØ(1-11)	$(EI)_{comp}$ FØ (1-11)
199-209	GCFØ(1-11)	$(G)_{comp}$ FØ (1-11)
210-220	ECFØ(1-11)	$(E)_{comp}$ FØ (1-11)
Locations 221 through 308 contain torque-box stiffness information identical to that in locations 1-88 but based on the evaluation temperature specified in TEIGJ(4), design temperature for flexible loads analysis. This data set will contain 0.0 values if the flexible loads analysis design data output option is not selected, variable DINID = 0.0 or 3.0. The data set in locations 265 through 308 will be identical to that in 221 through 264 if flutter stiffness requirements are not evaluated or if the surface is not flutter critical.		
221-231	GJSFL(1-11)	$(GJ)_{st}$ FL (1-11)
232-242	EISFL(1-11)	$(EI)_{st}$ FL (1-11)
243-253	GSFL(1-11)	$(G)_{st}$ FL (1-11)

TABLE 217. CD ARRAY, LOCATIONS 1-400, STIFFNESS DATA ARRAYS (CONCL)

CD Array Location	Variable Name	Description
254-264	ESFL(1-11)	$(E)_{st}$ FL (1-11)
265-275	GJCFL(1-11)	$(GJ)_{comp}$ FL (1-11)
276-286	EICFL(1-11)	$(EI)_{comp}$ FL (1-11)
287-297	GCFL (1-11)	$(G)_{comp}$ FL (1-11)
298-308	ECFL(1-11)	$(E)_{comp}$ FL (1-11)
Locations 309 through 352 contain m-ply set increments for the four torque-box webs necessary to increase structure torsional stiffness to satisfy flutter stiffness requirements. This data set will contain 0.0 values if flutter stiffness requirements are not evaluated or if the surface is not flutter critical.		
309-319	DLRGJM(1-11)	$(\Delta m)_{upr}$ (1-11), m-ply set increment, upper cover skin.
320-330	DLRGJM(12-22)	$(\Delta m)_{lwr}$ (1-11), m-ply set increment, lower cover skin.
331-341	DLRGJM(23-33)	$(\Delta m)_{FS}$ (1-11), m-ply set increment, front spar web.
342-352	DLRGJM(34-44)	$(\Delta m)_{RS}$ (1-11), m-ply set increment, rear spar web.
Locations 353 through 396 contain the torque-box stiffness data set for strength and stability design only that is related to the data set in locations 89 through 132.		
353-363	GJVFS(1-11)	$(GJ)_{st}$ VF (1-11)
364-374	EIVFS(1-11)	$(EI)_{st}$ VF (1-11)
375-385	GVFS(1-11)	$(G)_{st}$ VF (1-11)
386-396	EVFS(1-11)	$(E)_{st}$ VF (1-11)
397-400	-	Not used

TABLE 218. TDC ARRAY, OVERLAY (18,0)

General information for array TDC:

Blank common reference location = T(1341)

Array size = 200 cells

Array TDC is used in overlay (18,0) as the primary array for data compatibility between the advanced composite analysis routines and the weight analysis routines programmed initially for metallic structure analysis. Section design data sets are created by subroutine ACNSTR to contain data similar to the metallic analysis data set described in Table 224, except for additional design information unique to advanced composite structures. These data sets are created after current pass synthesis operations are complete for all 11 analysis control stations. ACNSTR initiates a new 11-station analysis loop, creating required TDC array data for each station for current pass weight calculations. The weight analysis operations are initially performed by routines under control of subroutine WTCAL and subsequently by subroutine ATBØPT after the 11-station analysis loop is completed. During execution of advanced composite routines, values of the metallic analysis constants created by subroutine CNSTC are not altered - locations 1 through 67.

Array Location	Description
Locations 1 through 67 contain the same information as array TDC, overlays (9,0) and (10,0), described in Table 224. These locations are not used, however, during the execution of overlay (18,0) routine. This part of array TDC will contain data calculated by subroutine CNSTC, overlay (16,0), for use by overlays (9,0) and (10,0) during analysis of metallic designs. Since overlay (16,0) computations are made for both advanced composite and metallic analysis, these locations plus 162 through 165 will contain CNSTC calculated data. The T array print by subroutine WDDATA under control of IP(23) will reflect these values in T(1341) - T(1407) and T(1502) - T(1505).	
1 - 67	Not used, metallic torque-box analysis only. (Refer to Table 224.)

TABLE 218. TDC ARRAY, OVERLAY (18,0) (CONT)

Array Location	Description
Locations 68 through 120 contain advanced composite analysis data which are similar to those defined for metallic designs in Table 224. Data in these locations are computed by subroutine ACNSTR, overlay (18,0), for use by weight analysis and output print routines in overlay (18,0) that are the same as those found in the metallic analysis overlays. This data set is created by ACNSTR for each analysis control station and is printed by subroutine PRTB under control of internal print control word IPB. Code value for IPB is determined by subroutine ATBØPT, overlay (18,0), from IP(31) or IP(32).	
68	Not used.
69	D_{FS}, front spar mold line depth, in.
70	D_{RS}, rear spar mold line depth, in.
71	$-N_X$ cover axial load for down-bending condition, lb/in. ult.
72	$+N_X$ cover axial load for up-bending condition, lb/in. ult.
73	D', effective torque-box depth for cover axial loads, in.
74	GJ_{VF}, section torsional stiffness required to prevent surface flutter, lb-in.^{2}
75	V_{FS}, shear load on front spar, lb ult.
76	V_{RS}, shear load on rear spar, lb ult.
77	W, structure width of torque box, in.
78	D, average torque-box depth, in.
79	+V, design shear load for up-bending condition, lb ult.
80	+M, design bending moment for up-bending condition, in.-lb ult.
81	NØS, number of stringers or intermediate spars.
82	b, stringer or intermediate spar spacing, in.
83	$(f_{ccr})_{skin}$, allowable compression stress at the critical stability design condition for upper cover skins, psi.
84	$(f_c)_{skin}$, upper cover compression stress at critical design condition, psi.
85	$(f_{scr})_{skin}$, allowable shear stress at critical stability design condition for upper cover skin, psi.
86	$(f_s)_{skin}$, upper cover skin shear stress at critical design condition, psi.
87	$\bar{t}_{lwr}$, lower cover $\bar{t}$, in.

TABLE 218. TDC ARRAY, OVERLAY (18,0) (CONT)

Array Location	Description
88	$\bar{t}_{upr}$, upper cover $\bar{t}$, in.
89	Σt_{rib}, rib $\bar{t}$ for multirib designs (MR), intermediate spar $\bar{t}$ for multispar designs (MS), or honeycomb core $\bar{t}$ for fulldepth honeycomb sandwich designs (FDH), in.
90	$(\bar{t}_{misc\ skins})_{upr}$, upper cover exterior and interior protective film $\bar{t}$ for MR and MS/plates, plus core and bond $\bar{t}$ for MS/ honeycomb panel or exterior protection material $\bar{t}$ for FDH, in.
91	$(\bar{t}_{att})_{upr}$, rib-to-upper-cover attachment $\bar{t}$ for MR, intermediate spar-to-upper-cover attachment $\bar{t}$ for MS, 0.0 for FDH, in.
92	$(\bar{t}_{misc})_{rib}$, rib or spar miscellaneous structure $\bar{t}$ for MR and MS, 0.0 for FDH, in.
93	$(\bar{t}_{misc\ skin})_{rib}$, upper cover filler material $\bar{t}$ for MR and MS (material added to skins along rib or spar attachment lines) or 0.0 for FDH, in.
94	Not used.
95	$(A_{str})_{upr}$ area for each upper cover stringer for MR, area for each upper cover intermediate spar caps for MS/plates, plus equivalent area of upper cover core inserts at spar lines for MS/honeycomb panels, or equivalent area/inch for upper skin-to-core bond for FDH, sq in.
96	$(\bar{t}_{str})_{upr}$, $\bar{t}$ for $(A_{str})_{upr}$, in.
97	$(t_{str})_{upr}$, upper cover stringer gage for MR, 0.0 for MS or FDH, in.
98	$(h_{str})_{upr}$, upper cover stringer web height for MR, 0.0 for MS or FDH, in.
99	$(f_{str})_{upr}$, upper cover stringer flange width for MR, 0.0 for MS or FDH, in.
100	L_{rib}, rib spacing for MR, spar spacing for MS, 1.0 for FDH, in.
101	$(t_{core})_{upr}$, equivalent $\bar{t}$ for upper cover panel core and bond for MS/honeycomb panels, 0.0 for MR, MS/plates or FDH, in.
102	$(\bar{t}_{core})_{lwr}$, equivalent $\bar{t}$ for lower cover panel core and bond for MS/honeycomb panels, 0.0 for MR, MS/plates or FDH, in.

TABLE 218. TDC ARRAY, OVERLAY (18,0) (CONT)

Array Location	Description
103	$(\bar{t}_{core})_{rib}$, equivalent $\bar{t}$ for rib or spar core and web if webs are honeycomb panel design, 0.0 if corrugated webs or FDH, in.
104	$(\bar{t}_{pf})_{upr}$, equivalent $\bar{t}$ for upper cover exterior and interior protective finish for MR or MS, exterior protection material only for FDH, in.
105	$(\bar{t}_{pf})_{lwr}$, equivalent $\bar{t}$ for lower cover exterior and interior protective finish for MR or MS, exterior protection material only for FDH, in.
106	$(\bar{t}_{pf})_{rib}$, equivalent $\bar{t}$ for rib or spar web protective film for MR or MS, 0.0 for FDH, in.
107	$(t_{web})_{rib}$, rib web gage for MR, intermediate spar web gage for MS, in.; ratio of core density to foil density for FDH.
108	Not used.
109	$\bar{Y}_{upr}$, load centroid for upper cover, distance from outer mold line of cover, in.
110	$\bar{Y}_{lwr}$, load centroid for lower cover, distance from outer mold line of cover, in.
111	Not used.
112	$(t_{skin})_{lwr}$, lower cover skin gage, in.
113	Not used.
114	$(t_{skin})_{upr}$, upper cover skin gage, in.
115	Not used.
116	$(\Delta t_{skin})_{VF\ upr}$, upper cover skin gage increment for flutter design, in.
117	$(\Delta t_{skin})_{VF\ lwr}$, lower cover skin gage increment for flutter design, in.
118	$(\Delta \bar{t}_{str})_{VF\ upr}$, upper cover stringer/cap $\bar{t}$ increment for flutter design, value set to 0.0 for all designs, in.
119	$(\Delta \bar{t}_{str})_{VF\ lwr}$, lower cover stringer/cap $\bar{t}$ increment for flutter design, value set to 0.0 for all designs, in.
120	$(\Delta \bar{t}_{rib})_{VF}$, rib or intermediate spar $\bar{t}$ increment for flutter design, value set to 0.0 for all designs, in.

TABLE 218. TDC ARRAY, OVERLAY (18,0) (CONT)

Array Location	Description
Locations 121 through 139 contain skin and web laminate ply data for strength (121 through 135) and increments for flutter design (136 through 139). The values reflect total number of 0°, 45°, and 90° plies for each laminate. This set is printed by subroutine PRTB under control of internal print control code IPB.	
121	0° plies, upper cover skin.
122	45° plies, upper cover skin, total of +45° and -45° plies.
123	90° plies, upper cover skin.
124	0° plies, lower cover skin.
125	45° plies, lower cover skin, total of +45° and -45° plies.
126	90° plies, lower cover skin.
127	0° plies, rib or spar webs, 0.0 for FDH.
128	45° plies, rib or spar webs, total of +45° and -45° plies, 0.0 for FDH.
129	90° plies, rib or spar webs, 0.0 for FDH.
130	0° plies, front spar web.
131	45° plies, front spar web, total of +45° and -45° plies.
132	90° plies, front spar web.
133	0° plies, rear spar web.
134	45° plies, rear spar web, total of +45° and -45° plies.
135	90° plies, rear spar web.
136	Δ45° plies, for flutter design, upper cover skin, total of +45° and -45° plies.
137	Δ45° plies, for flutter design, lower cover skin, total of +45° and -45° plies.
138	Δ45° plies for flutter design, front spar web, total of +45° and -45° plies.
139	Δ45° plies for flutter design, rear spar web, total of +45° and -45° plies.
140-160	Not used.
Locations 161 through 174 contain lower cover data.	
161	Not used.
162	$(f_{ccr})_{lwr}$, allowable compression stress at critical stability design condition for lower cover skins, psi.
163	$(t_{str})_{lwr}$, lower cover stringer gage for MR, 0.0 for MS or FDH, in.

TABLE 218. TDC ARRAY, OVERLAY (18,0) (CONT)

Array Location	Description
164	$(h_{str})_{lwr}$, lower cover stringer web height for MR, 0.0 for MS or FDH, in.
165	$(f_{str})_{lwr}$, lower cover stringer flange width for MR, 0.0 for MS or FDH, in.
166	$(f_c)_{lwr}$, lower cover compression stress at critical design condition, psi.
167	Not used.
168	Not used.
169	$(\bar{t}_{misc\ skins})_{lwr}$, same as location 90 except for lower cover, in.
170	$(\bar{t}_{att})_{lwr}$, same as location 91 except for lower cover, in.
171	$(\bar{t}_{misc\ skin})_{rib}$, same as location 93 except for lower cover, in.
172	Not used.
173	$(A_{str})_{lwr}$, same as location 95 except for lower cover, sq in.
174	Not used.
Locations 175 through 194 contain front spar and rear spar data.	
175	$(\Delta t_w)_{VF\ FS}$, front spar web gage increment for flutter design, in.
176	$(\Delta t_w)_{VF\ RS}$, rear spar web gage increment for flutter design, in.
177	$(\Delta A_{VF})_{FS}$, incremented area of front spar web for flutter design, sq in.
178	$(\Delta A_{VF})_{FS}$, incremental area of rear spar web for flutter design, sq in.
179	ΣA_{FS}, cross-sectional area of front spar caps plus webs for strength design, sq in.
180	$(t_w)_{FS}$, front spar web gage for strength design, in.
181	$(A_{cap})_{FS}$, front spar cap area, total of upper and lower caps, sq in.

TABLE 218. TDC ARRAY, OVERLAY (18,0) (CONCL)

Array Location	Description
182	$(t_{pf,\ core,\ bond})_{FS}$, equivalent web thickness for front spar protective film for corrugated web design, plus core and bond material if honeycomb panel design, in.
183	$(f_s)_{FS}$, front spar web shear stress at critical design condition, psi.
184	$(f_{scr})_{FS}$, allowable shear stress at critical design condition for front spar web, psi.
185	$(t_{core})_{FS}$, front spar honeycomb panel core thickness for honeycomb panel design, 0.0 if corrugated web design, in.
186	ΣA_{RS}, cross-sectional area of rear spar caps plus webs for strength design, sq in.
187	$(t_w)_{RS}$, rear spar web gage for strength design, in.
188	$(A_{cap})_{RS}$, rear spar cap area, total of upper and lower caps, sq in.
189	$(t_{pf,\ core,\ bond})_{RS}$, equivalent web thickness for rear spar protective film for corrugated web design, plus core and bond material if honeycomb panel design, in.
190	$(f_s)_{RS}$, rear spar web shear stress at critical design condition, psi.
191	$(f_{SC})_{RS}$, allowable shear stress or critical design condition for rear spar web, psi.
192	$(t_{core})_{RS}$, rear spar honeycomb panel core thickness for honeycomb panel design, 0.0 if corrugated web design, in.
193	$(A_{web})_{FS}$, cross-sectional area of front spar web material for strength design, including effects of corrugation if corrugated web design, sq in.
194	$(A_{web})_{RS}$, cross-sectional area of rear spar web material for strength design, including effects of corrugation if corrugated web design, sq in.
195-200	Not used.

TABLE 219. DDUC AND DDLC ARRAYS

General information for arrays DDUC and DDLC:

Blank common reference locations: DDUC = CD(1), DDLC = CD(221)

Array sizes: 220 cells

Arrays DDUC and DDLC contain upper and lower cover data for the final design. This array is created by subroutine ACNSTR from output arrays of the structural synthesis routines for advanced composite torque-box analysis. Array data are used by ACNSTR to create input data for the weight analysis routines. Subroutine ACPRTA uses arrays DDUC and DDLC to print design summary output data. Subroutine ACNSTR initilizes array location to 0.0 values before processing design information into the arrays. DDUC and DDLC are printed by ACNSTR under control of print control code IPB, created by ATBØPT for each gross weight pass based on the status of IP(31) and IP(32), case control card 1, columns 31 and 32.

Array Location	Description
1-11	Critical load indicator for axial load, from CRLC(1,(1-11)) for upper cover, CRLC(2,(1-11)) for lower cover.
12-22	Critical load indicators for skin shear load, from CRLC(3,(1-11)) for both upper and lower cover. If upper cover is critical for combined shear and compression loads, this situation is indicated by the value of the critical load condition number plus 20.
23-33	$(N_X)_{cov}$, cover axial load for critical P/A condition from STRESS(1,(1-11),N_{cr}) for upper cover, STRESS(2,(1-11),N_{cr}) for lower cover, lb/in.
34-44	$(N_{XY})_{cov}$, skin shear load for critical shear condition, from STRESS(3,(1-11), N_{cr}), for both covers, lb/in.
45-55	$(f)_{skin}$, skin stress at critical load, $(N_X)_{cr}/t_{skin}$, psi.
56-66	$(f_s)_{skin}$, skin shear stress at critical load, $(N_{XY})_{cr}/t_{skin}$, psi.
67-77	l_{skin}, number of 0° plies in skin, calculated l x 2.0.
78-88	m_{skin}, number of 45° plies in skin, calculated m x 4.0.
89-99	n_{skin}, number of 90° ply in skin, calculated n x 2.0.
100-110	$(\Delta m_{VF})_{skin}$, number of incremental 45° plies necessary to satisfy flutter stiffness requirements in skin, calculated Δm x 4.0.

TABLE 219. DDUC AND DDLC ARRAYS (CONCL)

Array Location	Description
111-121	t_{core}, cover core thickness, multispar honeycomb panel design only, in.
122-132	t_{skin}, skin gage, total number of plies x t_L, in.
133-143	$\bar{t}_{cov}$, equivalent cover gage, sum of skin plus intermediate spar cap equivalent gage for multispar design, skin gage only for fulldepth honeycomb sandwich design and sum of skin plus stringer equivalent gage for multirib design, in.
144-154	Δt_{VF}, skin gage increment required to satisfy flutter stiffness requirements, in.
155-165	$\bar{Y}$, load centroid for cover load, distance between the outer mold line of the cover to the load point, in.
166-176	Not used
177-187	$(N_X)_{cr}$, allowable skin axial load for the critical stability design condition, from FCR(1,(1-11)) for upper cover, FCR (3,(1-11)) for lower cover, lb/in.
188-198	$(N_{XY})_{cr}$, allowable skin shear load for the critical stability design condition, from FCR(2,(1-11)) for upper cover, FCR (4,(1-11)) for lower cover, lb/in.
199-209	$(f_c)_{cr}$, allowable skin compression stress at the critical stability design condition, $(N_X)_{cr}/t_{skin}$, psi
210-220	$(f_s)_{cr}$, allowable skin shear stress at the critical stability design condition, $(N_{XY})_{cr}/t_{skin}$, psi.

TABLE 220. DDIS ARRAY

General information for array DDIS:

Blank common reference location = CD(441)

Array size = 220 cells

Array DDIS contains final design data for interior structures: intermediate spars for multispar designs, intermediate ribs for multirib designs and honeycomb for fulldepth honeycomb sandwich designs.

This array is similar to arrays DDUC and DDLC, Table 219.

Array Location	Description
1-11	Critical load indicator for crushing load on spar and rib webs only, from CRLC(7,(1-11)), same value as for front and rear spars.
12-22	Critical load indicator for spar web shear load for multispar, rib web crushing or column support condition, or core crushing or wrinkling condition, from CRLC(5,(1-11)).
23-33	$(P)_{spar}$, spar or rib web axial load for the critical P/A condition, from SPCRUH(1-11), lb/in.
34-44	$(N_{XY})_{spar}$, spar web shear load for the critical shear condition, from STRESS(5,(1-11),N_{cr}), for multispar design only. Value = 0.0 for multirib and fulldepth honeycomb designs, lb/in.
45-55	$(f_c)_{web}$, web compression stress, $(P)_{spar}/t_{web}$, psi
56-66	$(f_s)_{web}$, web shear stress, $(N_{XY})_{spar}/t_{web}$, psi.
67-77	l_{web}, number of 0° plies (vertical direction) in web, calculated l x 2.0.
78-88	m_{web}, number of 45° plies in web, calculated m x 4.0.
89-99	n_{web}, number of 90° plies (spanwise direction for intermediate spars, chordwise direction for intermediate ribs) in webs, calculated n x 2.0.
100-110	Not used
111-121	t_{core}, web core thickness for multispar and multirib designs if intermediate spar/rib web specified as honeycomb panel construction, value = 0.0 for fulldepth honeycomb design, in.
122-132	t_{web}, web gage, total number of plies x t_L for multispar and multirib designs, in. (ρ_{core}/ρ_f) for fulldepth honeycomb sandwich designs.
133-143	A_{cap}, intermediate spar cap area for multispar design, sq in. Value = 0.0 for multirib design. $(\rho_{bond}/\rho_{skin})$ for fulldepth honeycomb sandwich designs.

TABLE 220. DDIS ARRAY (CONCL)

Array Location	Description
144-154	Not used
155-165	b_{spar}, spar spacing for multispar design and L_{rib}, rib spacing for multirib design, from SPB(1-11), in. (t_f/ρ_f) for fulldepth honeycomb sandwich design.
166-176	NØS, number of intermediate spars for multispar design, from [SPN(1-11)-2.0)], number of stringers for multirib design from SPN(1-11). Core density, lb/cu ft, for fulldepth honeycomb sandwich design.
177-187	$(P)_{cr}$, allowable web or core axial load for the critical stability design condition, from FCR(7,(1-11)), lb/in.
188-198	$(N_{CY})_{cr}$, allowable web shear load for the critical stability design condition, multispar and multirib design, allowable core axial load for fulldepth honeycomb sandwich design; from FCR(8,(1-11)), lb/in.
199-209	$(f_c)_{cr}$, allowable compression stress for webs at the critical stability design condition, $(P)_{cr}/t_{web}$, psi.
210-220	$(f_s)_{cr}$, allowable shear stress for webs at the critical stability design condition, $(N_{CY})_{cr}/t_{web}$, psi.

TABLE 221. DDFS AND DDRS ARRAYS

General information for arrays DDFS and DDRS:

Blank common reference location: DDFS = CD(661), DDRS = CD(881)

Array sizes = 220 cells

Array DDFS and DDRS contain front spar and rear spar data for the final design. These arrays are similar to arrays DDUC and DDLC, Table 219. The processing of data in these arrays is the same as for DDUC and DDLC.

Array Location	Description
1-11	Critical load indicator for crushing load on spar webs, from CRLC(7,(1-11)).
12-22	Critical load indicator for web shear load, from CRLC (4,(1-11)) for front spar, CRLC(6,(1-11)) for rear spar. If the web is critical for combined shear and compression loads, this situation is indicated by the value of the critical load condition number plus 20.
23-33	$(P)_{spar}$, spar web axial load for the critical P/A condition, from SPCRUH(1-11), lb/in.
34-44	$(N_{XY})_{spar}$, spar web shear load for the critical shear condition, from STRESS(4,(1-11), N_{cr}) for front spar, STRESS (6,(1-11), N_{cr}) for rear spar, lb/in.
45-55	$(f_c)_{web}$, web compression stress, $(P)_{spar}/t_{web}$, psi.
56-66	$(f_s)_{web}$, web shear stress, $(N_{XY})_{spar}/t_{web}$, psi.
67-77	l_{web}, number of 0° plies (vertical direction) in spar webs, calculated l x 2.0.
78-88	m_{web}, number of 45° plies in spar web, calculated m x 4.0.
89-99	n_{web}, number of 90° plies (spanwise direction) in spar web, calculated n x 2.0
100-110	$(\Delta m_{VF})_{web}$, number of incremental 45° plies necessary to satisfy flutter stiffness requirements in web, calculated Δm x 4.0.
111-121	t_{core}, spar web core thickness if specified as honeycomb panel construction, in.
122-132	t_{web}, web gage, total number of plies x t_L, in.
133-143	$(A_{cap})_{upr}$, upper spar cap area, sq. in.

TABLE 221. DDFS AND DDRS ARRAYS (CONCL)

Array Location	Description
144-154	Δt_{VF}, web gage increment required to satisfy flutter stiffness requirements, in.
155-165	$(A_{cap})_{lwr}$, lower spar cap area, sq. in.
166-176	Not used
177-187	$(P)_{cr}$, allowable spar with axial load for the critical stability design condition, from FCR(5,(1-11)) for front spar, FCR (9,(1-11)) for rear spar, lb/in.
188-198	$(N_{XY})_{cr}$, allowable spar web shear load for the critical stability design condition, from FCR(1,(1-11)) for front spar, FCR(10,(1-11)) for rear spar, lb/in.
199-209	$(f_c)_{cr}$, allowable spar web compression stress at the critical stability design condition, $(P)_{cr}/t_{web}$, psi
210-220	$(f_c)_{cr}$, allowable spar web shear stress at the critical stability design condition $(N_{XY})_{cr}/t_{web}$, psi

TABLE 222. DDSTR ARRAY

General information for array DDSTR:

Blank common reference location = CT(1321)

Array size = 330 cells

Array DDSTR contains final cover design data for multirib designs to supplement the information stored in arrays DDUC, DDLC, DDIS, DDFS and DDRS. The processing of data for DDSTR is similar to these arrays, refer to Table 219 for additional details.

Array Location	Description
1-11	$(b_{str})_{upr}$, upper cover stringer spacing, from STRING (1,1,(1-11)), in.
12-22	$(A_{str})_{upr}$, upper cover stringer area, from STRING (1,9, (1-11)), sq. in.
23-33	$(t_{str})_{upr}$, upper cover stringer gage, from STRING (1,8, (1-11)), in.
34-44	$(h_{str})_{upr}$, upper cover stringer height, from STRING (1,6, (1-11)), in.
45-55	$(f_{str})_{upr}$, upper cover stringer flange width, from STRING (1,7,(1-11)), in.
56-66	$(1_{str})_{upr}$, number of 0° plies in upper cover stringer, from STRING(1,10,(1-11))
67-77	$(\bar{Y}_{str})_{upr}$, upper cover stringer centroid location, distance from stringer centroid to inner surface of the skin, from STRING(1,5,(1-11)), in.
78-88	$(I_{str})_{upr}$, upper cover stringer area moment of inertia, from STRING(1,4,(1-11)), in^4.
89-99	L_{rib}, rib spacing, from STRING(1,2,(1-11)), in.
100-110	$(\bar{t}_{str})_{upr}$, equivalent stringer gage, upper cover, $(A_{str}/b_{str})_{upr}$, in.
111-121	$(b_{str})_{lwr}$, lower cover stringer spacing, from STRING (1,1,(1-11)), in.
122-132	$(A_{str})_{lwr}$, lower cover stringer area, from STRING(2,9, (1-11)), sq. in.
133-143	$(t_{str})_{lwr}$, lower cover stringer gage, from STRING(2,8, (1-11)), in.

TABLE 222. DDSTR ARRAY (CONT)

Array Location	Description
144-154	$(h_{str})_{lwr}$, lower cover stringer height, from STRING(2,6,(1-11)), in.
155-165	$(f_{str})_{lwr}$, lower cover stringer flange width, from STRING (2,7,(1-11)), in.
166-176	$(1_{str})_{lwr}$, number of 0° plies in lower cover stringer, from STRING(2,10,(1-11)).
177-187	$(\bar{Y}_{str})_{lwr}$, lower cover stringer centroid location, distance from stringer centroid to inner surface of the skin, from STRING(2,5,(1-11)), in.
188-198	$(I_{str})_{lwr}$, lower cover stringer area moment of inertia, from STRING(2,4,(1-11)), in^4.
199-209	L_{rib}, rib spacing, from STRING(1,2,(1-11)), in.
210-220	$(\bar{t}_{str})_{lwr}$, equivalent stringer gage, lower cover, $(A_{str}/b_{str})_{lwr}$, in.
221-231	$(N_X)_{sk\ upr}$, upper cover skin load for the critical condition, from SKNXU(1-11), lb/in.
232-242	$(N_X)_{str\ upr}$, upper cover stringer load for the critical condition, from STNXU(1-11), lb/in.
243-253	$(f)_{sk\ upr}$, upper cover skin stress for the critical condition, (+) = compression, (-) = tension, from FSKU(1-11), psi.
254-264	$(f)_{str\ upr}$, upper cover stringer stress for the critical condition, (+) = compression, (-) = tension, from FSTU(1-11), psi.
265-275	$(L_{rib\ allow}/L_{min})_{upr}$, ratio of allowable rib spacing for upper cover skin/stringer column to minimum spacing, from BRRU(1-11).
276-286	$(N_X)_{sk\ lwr}$, lower cover skin load for the critical condition, from SKNXL(1-11), lb/in.
287-297	$(N_X)_{str\ lwr}$, lower cover strings load for the critical condition, from STNXL(1-11), lb/in.
298-308	$(f)_{sk\ lwr}$, lower cover skin stress for the critical condition, from FSKL(1-11), psi.

TABLE 222. DDSTR ARRAY (CONCL)

Array Location	Description
309-319	$(f)_{str\ lwr}$, lower cover stringer stress for the critical condition, from FSTL(1-11), psi.
320-330	$(L_{rib\ allow}/L_{min})_{lwr}$, ratio of allowable rib spacing for lower cover skin/stringer column to minimum spacing, from BRRL(1-11).

TABLE 223. DSPLØ ARRAY, ANALYSIS CONSTANTS

General information for array DSPLØ:

Blank common reference location = D(58)

Array size = 7 cells

Array contains constants for bulkhead and chordwise splice analysis.

This array is part of the D array; initial values are contained in the wing deck of the SWEEP permanent data bank. All initial array values can be changed by revising the permanent data deck or through D array reference cards in the input variable data deck for wing and empennage, locations D(58) through D(64). (Note: Location DSPLØ(7) is used as a search constant by subroutines BØT, TSCH, and SFSCH, referenced as D(64).

Array Loc	Data Bank Value	Description
1	0.250	$D_{min\ bolt}$, minimum splice bolt diameter, in.
2	0.750	$D_{max.\ bolt}$, maximum splice bolt diameter, in.
3	1.500	K_{head}, factor for diameters of bolthead diameter calculations
4	0.156	$t_{sk\ min}$, minimum skin thickness at chordwise splice, in.
5	1.333	K_{sk}, factor for skin thickness at chordwise splice
6	1.250	K_L, factor for delta skin splice machine runout area, factor for bolthead volume
7	0.0001	Tolerance for search control, subroutines BØT, TSCH and SFSCH, referenced as D(64).

TABLE 224. TDC ARRAY, OVERLAYS (9,0) AND (10,0)

General information for array TDC:

Blank common reference location = T(1341)

Array size = 200 cells

Array TDC is used for storage and retrieval of analysis constants for metallic design and primary design data output from the structural synthesis analysis at each of the 11 analysis control stations. The section design data set is created by both metallic and advanced composite routines for use by the same weight analysis routines. Metallic analysis data set is created primarily by subroutines CNSTR and SECTD, overlay (10,0), and are defined in this table. The advanced composite data set created by subroutine ACNSTR, overlay (18,0), is similar in content and is described in Table 218. The analysis constants data set is created by subroutine CNSTC, overlay (16,0), before execution of either the metallic or advanced composite analysis routines. Initial values in array TDC after CNSTC calculations are printed by subroutine WDDATA as part of array T, printed under control of IP(23), case control card 1, column 23. WDDATA initializes all TDC array locations to 0.0 values prior to execution of subroutine CNSTC.

Array Location	Description
	Locations 1 through 36 contain material properties data in table form used by overlay (10,0) routines. Table data are used in the numerical interpolation procedures programmed to determine design values of stress levels. This table is created by subroutine CNSTC, overlay (16,0). The table consists of b/t and E_T values for 12 compression stress level points. The first five points define the elastic part of the stress-strain curve with five equally spaced stresses up to the proportional limit stress. Points 5 through 12 define the plastic part of the stress-stain curve; the stresses are equally spaced between the proportional limit and compression yield stresses. The b/t values are computed for plate buckling coefficient of 4,0.
1	$(f_c)_1$, psi
2	$(f_c)_2$, psi
3	$(f_c)_3$, psi
4	$(f_c)_4$, psi

TABLE 224. TDC ARRAY, OVERLAYS (9,0) AND (10,0) (CONT)

Array Location	Description
5	$(f_c)_5$, proportional limit stress, psi.
6	$(f_c)_6$, psi.
7	$(f_c)_7$, psi.
8	$(f_c)_8$, psi.
9	$(f_c)_9$, psi.
10	$(f_c)_{10}$, psi.
11	$(f_c)_{11}$, psi.
12	$(f_c)_{12}$, compression yield stress, psi.
13	$(b/t)_1$
14	$(b/t)_2$
15	$(b/t)_3$
16	$(b/t)_4$
17	$(b/t)_5$
18	$(b/t)_6$
19	$(b/t)_7$
20	$(b/t)_8$
21	$(b/t)_9$
22	$(b/t)_{10}$
23	$(b/t)_{11}$
24	$(b/t)_{12}$
25	$(E_T)_1$, psi.
26	$(E_T)_2$, psi.
27	$(E_T)_3$, psi.
28	$(E_T)_4$, psi.
29	$(E_T)_5$, psi.
30	$(E_T)_6$, psi.
31	$(E_T)_7$, psi.
32	$(E_T)_8$, psi.

TABLE 224. TDC ARRAY, OVERLAYS (9,0) AND (10,0) (CONT)

Array Location	Description
33	$(E_T)_9$, psi.
34	$(E_T)_{10}$, psi.
35	$(E_T)_{11}$, psi.
36	$(E_T)_{11}$, psi.
Locations 37 through 45 contain strain, elastic moduli, and b/t values computed by subroutines SS and SS2 for the compression stress level stored in location 51, variable SFC. These nine locations are referenced by SS and SS2 as array SA variables, locations 1 through 9. Calling subroutines reference these locations in terms of array TDC locations.	
37	ϵ_i, material strain, variable SA(1), in./in.
38	$(E_T)_i$, tangent modulus, variable SA(2), psi.
39	$(E_S)_i$, secant modulus, variable SA(3), psi.
40	$(E_{RL1})_i$, reduced modulus of form $(E_T\ E_S)^{1/2}$, currently not used, variable SA(4), psi.
41	$(E_{RL2})_i$, reduced modulus of form E_S, currently not used, variable SA(5), psi.
42	$(E_{RG1})_i$, reduced modulus of form E_T, currently not used, variable SA(6), psi.
43	$(E_{RG2})_i$, reduced modulus of form $E_S\left[0.83 + 0.17\ (E_T/E_S)\right]$, currently not used, variable SA(7), psi.
44	$(E_{RSK1})_i$, reduced modulus of form $E_S\left\{0.5 + 0.5\left[0.25 + 0.75\ (E_T/E_S)\right]^{1/2}\right\}$ for plate buckling of skins and webs, variable SA(8), psi.
45	$(b/t)_i$, allowable plate buckling b/t for infinitely long plates, simply supported at edges (buckling coefficient = 4.0), variable SA(9).
46	$(f_c)_{max\ upr\ cov}$, maximum compression stress level for upper cover design, initially set up by CNSTC and revised by CNSTR, psi.

TABLE 224. TDC ARRAY, OVERLAYS (9,0) AND (10,0) (CONT)

Array Location	Description
47	X_i, variable CXI computed by subroutine CG3P. For evaluation code IK = 1.0, X-value at minimum y determined from parabolic equation fit, y = f(x), for three specified points; or for code IK = 2.0, value of X at Y = 1.0. Subroutine BØTC uses this location for storage of f_{ci}, variable SFC, current analysis value of stress, psi.
48	Δf_{c1}, $f_{pl}/5.0$, proportional limit stress/5.0, calculated and used by CNSTC to compute stress values in locations 1, 2, 3, and 4, psi. Subsequently changed to ratio $\left[(f_t)_{max}/\Delta(f_c)_{max}\right]_{upr\ cov}$ by CNSTC and CNSTR. Used by CNSTR for estimation of maximum f_c value in TDC(55), which represents cutoff compression stress for P/A design, one of the limiting values used to determine starting f_c values in stress level search loop of subroutine SFSCH.
49	Δf_{c2}, $(f_{cy} - f_{pl})/7.0$, difference between yield and proportional limit stresses divided by 7.0, calculated and used by CNSTC to compute stress values in locations 6 through 11, psi. Subsequently changed to $(f_t)_{max\ upr\ cov}$, by CNSTC and CNSTR, maximum tension stress level for upper cover design, psi.
50	ϵ_{fc}, larger of $\Delta f_{c2}/25.0$ or 50, stress level interval used in stress level searches, psi.

Locations 51 through 54 contain stress-strain information for use by subroutines SS and SS2. SS and SS2 use location 51 as the storage location for variable SFC, evaluation stress value. Locations 52, 53, and 54 contain equation constants for the stress-strain curve to be evaluated by SS and SS2. These constants are created by CNSTC from array DMTLB, locations 3, 4, and 5. Subroutine SS and SS2 reference locations 52, 53, and 54 as array SD variables, locations SD(1), SD(2), and SD(3).

TABLE 224. TDC ARRAY, OVERLAYS (9,0) AND (10,0) (CONT)

Array Location	Description
51	$(f_c)_i$, evaluation stress for subroutines SS and SS2, variable SFC, psi.
52	(a), coefficient (a) for stress-strain curve equation, variable SD(1).
53	(b), coefficient (b) for stress-strain curve equation, variable SD(2).
54	E, elastic modulus for stress-strain curve equation, variable SD(3), psi.
55	$(f_c)_{max}$, maximum compression stress level for upper cover design, (P/A) allowable, larger of input compression stress cutoff value or $(P/A)_{comp}$ due to required $\bar{t}_{upr}$ for upper cover tension load requirement, set up initially by CNSTC, revised by CNSTR for use by SECTD and SFSCH, psi.
56	$(b/t)_{fcmax}$, allowable plate buckling b/t for compression stress in location 55.
57	$(K_{b/t})_{skin}$, constant for skin buckling equation, $\left\{K\pi^2/\left[12\ (1-\mu^2)\right]\right\}^{1/2}$, set up by CNSTC, where K = 4.0.
58	$(K_{b/t})_{str}$, $\left[K_{str}/K_{skin}\right]^{1/2}$, factor for stringer web allowable b/t, applied to allowable skin b/t, K_{str} = 0.426 for integral I-stringers, 4.0 for riveted and integral Z-stringers, K_{skin} = 4.0, calculated by CNSTC.
59	K_{str}, buckling coefficient for stringer web, 0.426 for integral I-stringers, 4.0 for riveted and integral Z-stringers.
60	$(f_t)_{max\ lwr\ cov}$, maximum tension stress level for lower cover, (P/A) design, initially set up by CNSTC and revised by CNSTR, psi.
61	$(f_s)_{max}$, maximum shear stress for cover design, set up by CNSTC but not used, psi.
62	$(K_L)_{rib}$, coefficient for allowable local instability compression stress on corrugated rib web, 0.40, input value from D(401), set up by CNSTC for use by STRIB and SRRIB.

TABLE 224. TDC ARRAY, OVERLAYS (9,0) AND (10,0) (CONT)

Array Location	Description
63	$(K_g)_{rib}$, coefficient for allowable general instability compression stress on corrugated rib web, 1.425, input value from D(402), set up by CNSTC for use by STRIB.
64	$(K_{tsk})_{min}$, variable TKKMN, minimum ratio of skin gage to cover t-bar, initially set up by CNSTC from input value of D(365), or if 0.0, from D(67). Value changed for every analysis control station if integer code word ICD, ND(49), has a value other than +1, $(K_{tsk})_i$ values moved from D(721) - D(731) if input as positive values. Code word ICD set up by CNSTC from value of input variable CØNTC, D(367), ICD = 1 for CØNTC = (0.0) or (-), +2 for CØNTC = positive nonzero value.
65	$(K_{tsk})_{max}$, variable TKKMX, maximum ratio of skin gage to cover t-bar, initially set up by CNSTC from input value of D(366), or if 0.0, from D(68). Value changed by CNSTR as explained previously, for $(K_{tsk})_{min}$.
66	$\left[K_E/(1 - \mu^2)\right]_{FS}$, material constant of stability equation used for front spar web analysis, where K_E is factor applied to compression cover E to obtain front spar material E. ($(K_E)_{FS}$ is stored in TWT(180)).
67	$\left[K_E/(1- \mu^2\right]_{RS}$, material constant for stability equation used for rear spar web analysis, where K_E is factor applied to compression cover E to obtain rear spar material E. ($(K_E)_{RS}$ is stored in TWT(181)).
Locations 68 through 80 contain torque-box design information for the current analysis control station. This data set, except for location 68, is set up by CNSTR. Subroutine SECTD computes the value of $NØS_{max}$ in location 68.	

TABLE 224. TDC ARRAY, OVERLAYS (9,0) AND (10,0) (CONT)

Array Location	Description
68	$N\emptyset S_{max}$, maximum number of intermediate spars or stringers to be used in analysis, value computed on the basis of type of analysis option selected. This value is used as the starting value for the basic search loop for number of spanwise supporting elements for multispar design or number of skin stiffening elements for multirib design programmed in SECTD.
69	D_{FS}, front spar mold line depth, in.
70	D_{RS}, rear spar mold line depth, in.
71	$-N_X$, cover axial load for down-bending condition, lb/in. ult.
72	$+N_X$, cover axial load for up-bending condition, lb/in. ult.
73	D', effective torque-box depth for axial load calculations, in.
74	GJ_{VF}, section torsional stiffness required to prevent surface flutter, lb-in.^{2}
75	V_{FS}, shear load on front spar, lb ult.
76	V_{RS}, shear load on rear spar, lb ult.
77	W, structural width of torque-box, in.
78	D, average torque-box depth, in.
79	+V, design shear load, up-bending condition, lb ult.
80	+M, design bending moment, up-bending condition, in.-lb ult.

Locations 81 through 120 initially contain design data resulting from the torque-box synthesis analysis for strength requirements. This data set is set up by SECTD from TSC(1 - 40) or TSC(81 - 120), depending upon the NØS value selected as the optimum point. The data blocks stored in TSC(4) - TSC(38) and TSC(84) - TSC(118) were originally calculated by the synthesis routines and stored in locations TSC(381) - TSC(415) for each point evaluated under control of subroutines SFSCH and TSCH. (Refer to Table 225.)

Contents of locations 87, 103, 105, 107, 109 - 113, and 116 - 120 are subsequently changed by SECTD. Changes are made as required for (1) tension cover design, (2) flutter stiffness requirements, (3) vertical tail analysis where tension cover requirements are set equal to the compression cover requirements, and (4) data set arrangement for output print by subroutine PRTB.

TABLE 224. TDC ARRAY, OVERLAYS (9,0) AND (10,0) (CONT)

Array Location	Description
81	NØS, number of stringers or intermediate spars, same as TSC(1), originally calculated by SFSCH.
82	b, stringer or intermediate spar spacing, same as TSC(2), originally calculated by SFSCH, in.
83	$(f_c)_{max}$, maximum compression stress used in stress level search, same as TSC(3), originally calculated by SFSCH, psi.
84	$(f_c)_{opt}$, design compression stress level, same as TSC(381), psi.
85	A_{upr}, compression cover area for each stringer or spar bay, same as TSC(382), sq in./stringer or sq in./spar.
86	$\Sigma \bar{t}_{upr}$, total material equivalent gage, same as TSC(383), in.
87	$\bar{t}_{lwr}$, lower cover $\bar{t}$, originally 0.0 from TSC(384), revised by SECTD during tension cover analysis or set to value in TDC(88) if vertical tail, $(t_{skin} + \bar{t}_{str/spar\ cap})_{lwr}$, in.
88	$\bar{t}_{upr}$, upper cover $\bar{t}$, same as TSC(385), in.
89	$\Sigma \bar{t}_{rib}$, rib or spar $\bar{t}$, same as TSC(386), in.
90	$(\bar{t}_{misc\ skin})_{upr}$, same as TSC(387), in.
91	$(\bar{t}_{att})_{upr}$, same as TSC(388), in.
92	$(\bar{t}_{misc})_{rib}$, same as TSC(389), in.
93	$(\bar{t}_{misc\ skin})_{rib\ upr}$, same as TSC(390), in.
94	$(A_{str})_{min\ upr}$, same as TSC(391), sq. in.
95	$(A_{str})_{upr}$, same as TSC(392), sq in.
96	$(\bar{t}_{str})_{upr}$, same as TSC(393), in.
97	$(t_{str})_{upr}$, same as TSC(394), in.
98	$(h_{str})_{upr}$, same as TSC(395), in.
99	$(f_u)_{upr}$, same as TSC(396), in.
100	L_{rib}, same as TSC(397), in.
101	$(I_{str})_{upr}$, same as TSC(398), in.^{4}/in.
102	$(\rho_{str})_{upr}$, same as TSC(399), in.
103	$(E_R)_{sk\ upr}$, same as TSC(402), psi.
104	$(E_T)_{upr}$, same as TSC(401), psi.

TABLE 224. TDC ARRAY, OVERLAYS (9,0) AND 10,0) (CONT)

Array Location	Description
105	$(b/t)_{str\ upr}$, same as TSC(410).
106	$(b/t)_{h\ cr\ upr}$, same as TSC(403).
107	$(t_w)_{rib}$, same as TSC(408), in.
108	L_{rib}/L_{min}, same as TSC(405).
109	$(b/t)_{skin\ upr}$, same as TSC(409).
110	$(b/t)_{skin\ lwr}$, calculated by SECTD.
111	$(f_t)_{lwr}$, tension stress for lower cover, calculated by SECTD, psi.
112	$(t_{skin})_{lwr}$, lower cover skin gage, calculated by SECTD, in.
113	$(\Sigma \bar{t}_{cov})_{lwr}$, lower cover $\bar{t}$, calculated by SECTD, in.
114	$(t_{skin})_{upr}$, upper cover skin gage, same as TSC(411), in.
115	$(A_{skin})_{upr}$, same as TSC(412), sq in.
116	$(\Delta t_{skin})_{VF\ upr}$, incremental upper cover skin gage for flutter design, calculated by SECTD during flutter analysis pass, in.
117	$(\Delta t_{skin})_{VF\ lwr}$, incremental lower cover skin gage for flutter design, calculated by SECTD during flutter analysis pass, in.
118	$(\Delta \bar{t}_{str})_{VF\ upr}$, incremented upper cover stringer $\bar{t}$ for flutter design, calculated by SECTD during flutter analysis pass, in.
119	$(\Delta \bar{t}_{str})_{VF\ lwr}$, incremented lower cover stringer $\bar{t}$ for flutter design, calculated by SECTD during flutter analysis pass, in.
120	$(\Delta \bar{t}_{rib})_{VF}$, incremental rib or spar $\bar{t}$ for flutter design, calculated by SECTD during flutter analysis pass, in.
Locations 121 through 160 contain TDC(81) - TDC(120) data for analysis station i-1, saved by subroutine WTCAL.	
121 - 160	TDC(81) - TDC(120) data set for previous analysis station.
Locations 161 through 174 contain lower cover (tension design) data calculated by CNSTC, CNSTR, or SECTD.	

TABLE 224. TDC ARRAY, OVERLAYS (9,0) AND (10,0) (CONT)

Array Location	Description
161	K_{NXL}, ratio of down-bending N_X to upbending N_X, calculated by CNSTR.
162	$(f_c)_{max\ lwr\ cav}$, maximum allowable compression stress level for lower cover design; calculated initially by CNSTC and revised by CNSTR, psi.
163	E_{lwr}, elastic modulus for lower cover, calculated by CNSTC, psi.
164	ρ_{lwr}, density of lower cover material, calculated by CNSTC, lb/in^3.
165	eff_{lwr}, factor for lower cover compression analysis, calculated by CNSTC based on cover construction type.
166	$(f_c)_{lwr}$, lower cover compression stress, calculated by SECTD, psi.
167	α_{bw}, optimum stringer web factor for lower cover stringer compression analysis, calculated by SGCTD.
168	α_{tw}, optimum stringer gage factor for lower cover stringer compression analysis, calculated by SECTD. Changed to $(f_L)_{upr}$ (same as TSC(404)) by SECTD for output print, in.
169	α_{μ}, optimum stringer factor for lower cover compression analysis, calculated by SECTD. Changed to $(\bar{t}_{misc\ skin})_{lwr}$ (similar to TDC (901)) by SECTD, in.
170	β_{μ}, optimum stringer factor for lower cover compression analysis, calculated by SECTD. Changed to $(\bar{t}_{att})_{lwr}$ (similar to TDC(91)) by SECTD, in.
171	γ_{μ}, optimum stringer factor for lower cover compression analysis, calculated by SECTD. Changed to $(\bar{t}_{misc\ skin})_{rib\ lwr}$ (similar to TDC(93)) by SECTD, in.
172	$(\bar{t}_{comp})_{lwr}$, lower cover $\bar{t}$ required for compression, calculated by SECTD, in.
173	$(A_{str})_{lwr}$, lower cover stringer or spar cap area for each stringer or spar bay, calculated by SECTD, sq in.
174	$(b_{str})_{lwr}$, stringer or spar spacing for lower cover design, set to value in TDC(82) by SECTD, in.

TABLE 224. TDC ARRAY, OVERLAYS (9,0) AND (10,0) (CONT)

Array Location	Description
Locations 175 through 192 contain front spar and rear spar data calculated by SECTD.	
175	$(\Delta t_w)_{VF\ FS}$, incremental front spar web gage for flutter design, in.
176	$(\Delta t_w)_{VF\ RS}$, incremental rear spar web gage for flutter design, in.
177	$(\Delta A_{VF})_{FS}$, incremental area of front spar web for flutter design, sq in.
178	$(\Delta A_{VF})_{RS}$, incremental area of rear spar web for flutter design, sq in.
179	ΣA_{FS}, cross-sectional area of front spar caps plus web for strength design, sq in.
180	$(t_w)_{FS}$, front spar web gage for strength design, in.
181	$(A_{cap})_{FS}$, total area of upper and lower front spar caps, sq in.
182	b_{FS}, stiffener spacing for front spar web, in.
183	$(f_s)_{FS}$, shear stress on front spar web, psi.
184	$(f_{scr})_{FS}$, allowable shear stability stress for front spar web, psi.
185	$(\Delta A_{VF})_{FS}$, same as location 177, sq in.
186	ΣA_{RS}, cross-sectional area of rear spar caps plus web for strength design, sq in.
187	$(t_w)_{RS}$, rear spar web gage for strength design, in.
188	$(A_{cap})_{RS}$, total area of upper and lower rear spar caps, sq in.
189	b_{RS}, stiffener spacing for rear spar web, in.
190	$(f_s)_{RS}$, shear stress on rear spar web, psi.
191	$(f_{scr})_{RS}$, allowable shear stability stress for rear spar web, psi.
192	$(\Delta A_{VF})_{RS}$, same as location 178, sq in.

TABLE 224. TDC ARRAY, OVERLAYS (9,0) AND (10,0) (CONCL)

Array Location	Description
Locations 193 through 200 contain general analysis control data created by CNSTR, SECTD, and SFSCH during the analysis for each control station.	
193	$(f_c)_{min\ geom}$, stress level based on minimum skin gage and minimum $(t_{skin})/\bar{t}$ ratio, computed by SECTD, psi.
194	$(A_{str})_{min}$, minimum stringer in cap area, calculated by SECTD and TSCH, sq in.
195	$(f_c)_{max}$, P/A cutoff stress for compression design, calculated by SECTD, sq in.
196	$(f_c)_{kskmx}$, maximum allowable compression stress level for skin stability with $t_{skin} = (K_{skin})_{max}\ \bar{t}$ and minimum stringer or spar cap area, determined by SFSCH from subroutine BØT analysis with BØT analysis code word IK set to 2, psi.
197	K_{NXL}, input value of item in location 161 to be used as lower limit value for ratio by CNSTR. Initialized by CNSTR from input variable CKNXL, D(392), and changed by CNSTR to input option values for stations 1-11 from D(831) - D(841), input array DKNXL, if the value of data processing code word ICD = 2; i.e., D(367), input variable CØNTC, is specified as +1.0 or +2.0.
198	$NØS_{min}$, minimum number of stringers or spars for the current control station, calculated by SECTD from input data and local width.
199	$(NØS)_{bmax}$, integer member of stringer or spars at the current control station assuming specified value of b_{max}, calculated and used by SECTD to determine design value of $NØS_{min}$.
200	$(NØS)_{input}$, design value for NØS at current control station if input option for stations 1 - 11 is selected and data are input in D(776) - D(786), input array DCNØS. Set up by CNSTR only if data processing code word ICD = 2 (D(376) = +1.0 or +2.0) and array DCNØS contains input values. If no inputs, CNSTR sets value to 0.0 to conform to SECTD computation logic requirements.

TABLE 225. TSC ARRAY

General information for array TSC:

Blank common reference location = T(1541)

Array size = 420 cells

Array TSC is used by the metallic structure synthesis routines of overlay (10, 0) for storage and retrieval of torque-box design data computed during optimization analysis for each analysis station. Computed data are stored in one of four array blocks, each block associated with a specific level of the synthesis/optimization operations.

The first block, locations 1 through 120, is used during the first optimization search level for number of stringer or spar elements. These operations are controlled by subroutine SECTD. Two analysis passes are made by SECTD; first, optimization for strength-only requirements, and second, a strength plus flutter stiffness analysis, if required. Torque-box design data sets resulting from both analysis passes are saved for later use by the primary control subroutine CNSTR and subroutine WTCAL.

The second block is used to save data resulting from the second search level operations for optimum design stress. Subroutine SFSCH uses this block for storage of four 35-cell data sets in locations 121 through 260.

The third block, locations 261 through 380, contains four 30-cell data sets created during the third search level operations for optimum design thickness of the compression cover. Subroutine TSCH controls the skin gage analysis, using analysis results of subroutine STBAR that are stored in the fourth block, locations 381 through 420. This fourth block contains detail design data for the current analysis point identified by the parameters b_i, $(f_c)_i$, and $(t_{skin})_i$.

Subroutines SFSCH, TSCH, and STBAR use print subroutine PRTBK for output print of selected values from array TSC. These printing operations are governed by input controls in D(575) - D(578). The code value in D(578) identifies the iteration pass during which printed output is desired - 0.0 for no print, and value of 1, 2, 3, or 4 for print. The positive code value should be equal to or less than the value specified in D(369), input data variable DWNØ. (NOTE: Iteration passes are made in descending order of the DWNØ value, with 1.0 denoting the last pass. Internally, this code is identified as integer variable NØDW, ND(56).)

TABLE 225. TSC ARRAY (CONT)

D(575), D(576), and D(577) identify the analysis station for which data are to be printed; 0.0 meaning no print, and values of 1.0 through 11.0 for the station - 1.0 for the tip station, and 11.0 for the root station.

Array Location	Description
	Locations 1 through 120 contain three sets of compression cover design data computed for first-level search parameter values of NØS, number of stringer or intermediate spar elements at the current torque-box analysis station. These 40-cell data sets are created under control of subroutine SECTD from results of the second- and third-level searches programmed in subroutines SFSCH and TSCH. The first set, locations 1 through 40, consists of data computed for $NØS_i$, the current search parameter value specified to subroutine SFSCH during the two analysis passes of subroutine SECTD; first the strength-only analysis pass, and second, if required, strength analysis pass with compression cover skin constrained to required thickness for flutter. Locations 4 through 38 contain data identical to those in locations 381 through 415, the TSC array locations used by second- and third-level routines for storage of data computed for design stress levels, f_c, and skin thickness, t_{skin}. The second set is created from first set data resulting from the strength/flutter analysis pass. The third set is used during the strength-only pass for storage of data computed for $NØS_{i-1}$.
1	$NØS_i$, number of stringers or intermediate spars, current search parameter value.
2	b_i, stringer or spar spacing, $[W/(NØS_i+1)]$, in.
3	$(f_c)_{max}$, maximum compression stress level, limiting value for stress level search by SFSCH. Initially, the smaller of the compression cutoff stress and the P/A stress at minimum geometry. Value subsequently reduced by SFSCH as required to limiting stress levels dictated by conditions for skin stability and distribution of available material to satisfy skin/stringer geometry constraints.
4	$(f_c)_{opt}$, value selected by SFSCH as the optimum design stress level for $NØS_i$, same as TSC(381), psi.

TABLE 225. TSC ARRAY (CONT)

Array Location	Description
5	A_{upr}, compression cover area for each stringer or spar bay, $\bar{t}_{upr} \cdot b_i$, same as TSC(382), sq in./stringer or sq in./spar.
6	$\Sigma \bar{t}_{upr}$, total material equivalent gage, same as TSC(383), in.
7	$\bar{t}_{lwr}$, lower cover $\bar{t}$, set to 0.0 for compression cover search, same as TSC(384), in.
8	$\bar{t}_{upr}$, upper cover $\bar{t}$, same as TSC(385), in.
9	$\Sigma \bar{t}_{rib}$, rib or spar $\bar{t}$, same as TSC(386), in.
10	$(\bar{t}_{misc\ skin})_{upr}$ spanwise skin pad $\bar{t}$, same as TSC(387), in.
11	$(\bar{t}_{att})_{str}$, spanwise cover attachment $\bar{t}$, same as TSC(388), in.
12	$(\bar{t}_{misc})_{rib}$, rib miscellaneous material $\bar{t}$, same as TSC(389), in.
13	$(\bar{t}_{misc\ skin})_{rib}$, chordwise skin pad $\bar{t}$, same as TSC(390), in.
14	$(A_{str})_{min}$, minimum stringer or cap area, same as TSC(391), sq in.
15	A_{str}, stringer or cap area, same as TSC(392), sq in.
16	$\bar{t}_{str}$, stringer or cap $\bar{t}$, same as TSC(393), in.
17	t_{str}, stringer or cap gage, same as TSC(394), in.
18	h_{str}, stringer or cap web width, same as TSC(395), in.
19	f_u, riveting flange width, same as TSC(396), in.
20	L_{rib}, rib or spar spacing, same as TSC(397), in.
21	I_{str}, area moment of inertia for column, same as TSC(398), $in.^4/in.$
22	ρ_{str}, radius of gyration of stringer column, same as TSC(399), in.
23	ϵ_{sk}, strain for $(f_c)_{opt}$, same as TSC(400), psi.
24	E_T, tangent modulus for $(f_c)_{opt}$, same as TSC(401), psi.
25	$(E_R)_{skin}$, effective modulus of skin plate for $(f_c)_{opt}$, same as TSC(402), psi.
26	$(b/t)_{h\ cr}$, allowable crippling b/t for stringer web, same as TSC(403), psi.

TABLE 225. TSC ARRAY (CONT)

Array Location	Description
27	f_L, outstanding stringer flange width, same as TSC(404), in.
28	L_{rib}/L_{min}, ratio of allowable to minimum rib spacing, same as TSC(405).
29	$\bar{Y}_{cov}$, cover centroid, same as TSC(406), in.
30	$(b/t)_{f\ cr}$, allowable crippling b/t for stringer flange, same as TSC(407), in.
31	$(t_w)_{rib}$, rib or spar web gage, same as TSC(408), in.
32	$(b/t)_{skin}$, allowable b/t for skin, same as TSC(409).
33	$(b/t)_{str}$, allowable b/t for stringer web, same as TSC(410).
34	t_{skin}, skin gage, same as TSC(411), in.
35	A_{skin}, area of skin for stringer column, same as TSC(412), sq in.
36	$(\Delta \bar{t}_{misc\ skin})_{VF\ upr}$, incremental upper cover miscellaneous skin $\bar{t}$ for flutter design, calculated by SECTD during flutter analysis pass, in.
37	$(\Delta \bar{t}_{att})_{VF\ str}$, incremental cover attachment $\bar{t}$ for flutter design, calculated by SECTD during flutter analysis pass, in.
38	$(\Delta \bar{t}_{misc\ skin})_{VF\ lwr}$, incremental lower cover miscellaneous skin $\bar{t}$ for flutter design, calculated by SECTD during flutter analysis pass, in.
39	$(\Delta \bar{t}_{misc})_{VF\ rib}$, incremental rib miscellaneous material $\bar{t}$ for flutter design, calculated by SECTD during flutter analysis pass, in.
40	Not used.
41 - 80	TSC(1-40) data set for $NØS_{i-1}$ during flutter analysis pass NØS search by SECTD. Set to strength pass data set if flutter analysis is required, but increase in compression skin gage is not necessary for compression skin.
81 - 120	TSC(1-40) data set for $NØS_{i-1}$ during strength analysis NØS search by SECTD.

TABLE 225. TSC ARRAY (CONT)

Array Location	Description
Locations 121 through 260 contain four 35-cell data sets, similar to the items in locations 381 through 416, saved by subroutine SFSCH during the second-level search for optimum stress level. Data sets saved are for the last three valid stress level points stored in locations 121 through 155, 156 through 190, and 191 through 225. These data sets are compatible with the search point stress levels stored in array TSS, locations 10, 11, and 12, and are located by the value of the storage index value for LF1 for f_{c1}, LF2 for f_{c2}, and LF3 for f_{c3}. The data set in locations 226 through 260 contains the values for the first optimum point computed by SFSCH. This set is transferred to SECTD if the total t is less than that for the second optimum point.	
121 - 155	TSC(381) - TSC(416) data set 1 for stress level search.
156 - 190	TSC(381) - TSC(416) data set 2 for stress level search.
191 - 225	TSC(381) - TSC(416) data set 3 for stress level search.
226 - 260	TSC(381) - TSC(416) data set for first optimum stress level.
Locations 261 through 380 contain four 30-cell data sets, similar to the items in locations 383 through 412, saved by subroutine TSCH during the third-level optimum skin gage search for specified stress levels. These data sets are used in the same manner as the data sets in locations 121 through 260. Storage location index values in LT1, LT2, and LT3 are used to identify data set locations for the three skin gage search point values in array TSS, locations 4, 5, and 6. The fourth data set, locations 351 through 380, contains data for the first optimum skin gage point.	
261 - 290	TSC(383) - TSC(412) data set 1 for skin gage search.
291 - 320	TSC(383) - TSC(412) data set 2 for skin gage search.
321 - 350	TSC(383) - TSC(412) data set 3 for skin gage search.
351 - 380	TSC(383) - TSC(412) data set for first optimum skin gage.
Locations 381 through 420 contain design data computed for the current analysis point identified by the three search parameter values $NØS_i$, $(f_c)_i$, and $(t_{skin})_i$, stored in TSC(1), TSC(381), and TSC(411).	
381	$(f_c)_i$, stress level for current analysis point, value selected by subroutine SFSCH for use by subroutine TSCH for third-level skin thickness search and determination of optimum stringer geometry, psi.

TABLE 225. TSC ARRAY (CONT)

Array Location	Description
382	A_i, compression cover area for each stringer or spar bay, $b_i \cdot \bar{t}_i$, calculated by TSCH, sq in./stringer or sq in./spar.
383	$\Sigma \bar{t}_i$, total material equivalent gage used for optimum search, defined as the sum of equivalent material gage required for covers, supports, and fabrication (attachment and miscellaneous), calculated by STBAR as the sum of the t-bars stored in locations 384 through 390, in.
384	$\bar{t}_{lwr}$, tension cover $\bar{t}$, set to 0.0 for compression cover analysis, in.
385	$\bar{t}_i$, compression cover $\bar{t}$, $[N_x/(f_c)_i]$, computed by TSCH, in.
386	$\Sigma \bar{t}_{rib}$, equivalent material gage of cover support structures, intermediate ribs for multirib designs (MR), intermediate spars for multispar designs (MS) and honeycomb core for fulldepth honeycomb sandwich designs (FDH), calculated by subroutine STRIB, in.
387	$(\bar{t}_{misc\ skin})_{upr}$, equivalent material gage of skin pads along spanwise attachment lines for MR, riveted stringer, and MS, plus core for MS, honeycomb panels, or stringer fillets for MR integral stringers and 0.0 for FDH, calculated by STBAR, in.
388	$(\bar{t}_{att})_{str}$, equivalent material gage of cover attachments for spanwise elements, stringer-to-skin for MR (0.0 for integral stringers), spar-to-skin for MS and 0.0 for FDH, calculated by STBAR, in.
389	$(\bar{t}_{misc})_{rib}$, equivalent material gage of miscellaneous items for supporting structures for MR and MS, 0.0 for FDH, calculated by STRIB, in.
390	$(\bar{t}_{misc\ skin})_{rib}$, equivalent material gage of skin pads along chordwise ribs for MR, 0.0 for MS and FDH, cover panel bond for MS honeycomb panel, calculated by STRIB, in.
391	$(A_{str})_{min}$, minimum stringer or spar cap area for current analysis point, calculated by STRGØ, in.
392	A_{str}, stringer or intermediate cap area for current analysis point, calculated by STBAR, in.
393	$\bar{t}_{str}$, equivalent material gage for A_{str}, calculated by STBAR, in.

TABLE 225. TSC ARRAY (CONT)

Array Location	Description
394	t_{str}, web and flange gage for A_{str}, calculated by STRG, in.
395	h_{str}, stringer height or cap width for A_{str}, calculated by STRG, in.
396	f_u, riveting flange width for MR, riveted stringers, 0.0 for MR integral stringers, cap flange for MS, calculated by STRG, in.
397	L_{rib}, rib spacing for MR, spar spacing for MS, 1.0 for FDH, calculated by STRIL, in.
398	I_{str}, area moment of inertia for stringer- or cap-plus-skin column, calculated by STRIL, in.^{4}/in.
399	ρ_{str}, radius of gyration for stringer- or cap-plus-skin column, calculated by STRIL, in.
400	ϵ_{sk}, strain of cover material for $(f_c)_i$, calculated by TSCH, in.
401	E_T, tangent modulus for $(f_c)_i$, calculated by TSCH, psi.
402	$(E_R)_{sk}$, effective modulus of skin plate for $(f_c)_i$, calculated by TSCH, psi.
403	$(f_{ccr})_{rib}$, critical compression stress for rib or spar web column, calculated by STRIB, psi; changed by STBAR to $(b/t)_{h\ cr}$, allowable crippling b/t for stringer web.
404	$(E_R)_{rib}$, effective modulus for rib or intermediate spar web, calculated by STRIB, psi; changed by STBAR to f_L, outstanding flange width for riveted or integral Z-stringers for MR, and f_u for MS, in.
405	L_{rib}/L_{min}, ratio of allowable rib or spar spacing to minimum, calculated by STBAR, in.
406	$\bar{Y}_{cov}$, centroid of cover material, distance from outer surface of skin, moved from location 413 by STBAR, in.
407	R_{corrug}, radius of corrugation for rib webs, calculated by STRIB, in; changed by STBAR to $(b/t)_{f\ cr}$, allowable crippling b/t for stringer flanges.
408	$(t_w)_{rib}$, with gage for intermediate ribs or spars, calculated by STRIB, in.

TABLE 225. TSC ARRAY (CONCL)

Array Location	Description
409	$(b/t)_{skin}$, allowable b/t for skin, calculated by TSCH.
410	$(b/t)_{str}$, allowable b/t for stringer web, calculated by TSCH.
411	$(t_{sk})_i$, skin gage for current analysis point, created by STBAR from subroutine argument, in.
412	$(A_{skin})_i$, area of skin plate for each stringer or spar bay, calculated by STRG, sq in.
413	$\bar{Y}_{cov}$, cover centroid, same as location 406, calculated by STRIL, in.
414 - 420	Storage cells for intermediate calculations by STBAR, STRIL, STRIB, and BØT.

TABLE 226. TSEC ARRAY

General information for array TSEC:

Blank common reference location = CD(1501)

Array size = 300 cells

Array TSEC contains torque-box design data and constants used by the structural synthesis and weight analysis routines of overlays (9,0) and (10,0) for metallic designs and overlay (18,0) for advanced composite designs. Data stored in this array are initially created by overlay (16,0) routines. Additional constants are created and saved by the synthesis overlays in this array.

Subroutine WDDATA, overlay (16,0), prints the contents of array TSEC as part of the CD array output under control of IP(23), case control card 1, column 23.

Array Location	Description
	Locations 1 through 220 are arranged into 22 11-cell data sets for storage of current values for design parameters or output results. All of these data sets contain parameter values for the 11 structural analysis control stations, stored in sequential order from tip to root. Geometry parameters are created by subroutine WDDATA in overlay (16,0) and are not changed. Values for all other parameters are created first in overlay (16,0) and subsequently changed by the analysis routines for metallic or advanced composite designs.
1 - 11	$(+M_{x\Lambda})_{11-1}$, subarray ULTPM, ultimate design bending moment for up-bending design condition, computed by subroutines VLØAD1, VLØAD, and AVLØAD, in.-lb.
12 - 22	$(+V_{\Lambda})_{11-1}$, subarray ULTPV, ultimate design shear for up-bending design condition, lb.
23 - 33	$(+V_{FS})_{11-1}$, subarray UVFS, ultimate design shear for front spar web design, up-bending design condition, lb.

TABLE 226. TSEC ARRAY (CONT)

Array Location	Description
34 - 44	$(+V_{RS})_{11-1}$, subarray UVRS, ultimate design shear for rear spar web design, up-bending design condition, lb.
45 - 55	$(W_{struct})_{11-1}$, structural width of torque-box, distance between the front and rear spar planes along the structural chord of each analysis control station, created by WDDATA, in.
56 - 66	$(D_{ave})_{11-1}$, average depth of torque-box, created by WDDATA, in.
67 - 77	$(GJ_{VF})_{11-1}$, subarray GJR, required section stiffness for flutter design, calculated by subroutine GJCAL, lb-in.^{2}
78 - 88	$(D_{FS})_{11-1}$, front spar depth, distance between upper and lower mold lines, created by WDDATA, in.
89 - 99	$(D_{RS})_{11-1}$, rear spar depth, distance between upper and lower mold lines, created by WDDATA, in.
100 - 110	Not used.
111 - 121	$(-V_{\Lambda})_{11-1}$, subarray ULTNV, ultimate design shear for down-bending design condition, lb.
122 - 132	$(-M_{x\Lambda})_{11-1}$, subarray ULTNM, ultimate design bending moment for down-bending design condition, in.-lb.
133 - 143	$(\bar{Y}_o)_{upr\ 11-1}$, subarray YBUI, assumed centroid for upper cover, used for calculations of design N_x for current analysis pass, initially calculated by subroutine YBSET and recomputed by subroutine DWYBA at the conclusion of each analysis pass, distance from outer mold line of upper cover, in.
144 - 154	$(+M_{y\Lambda})_{11-1}$, subarray ULTPT, ultimate design torsional moment for up-bending design condition, in.-lb.
155 - 165	$(-M_{y\Lambda})_{11-1}$, subarray ULTNT, ultimate design torsional moment for down-bending design condition, in.-lb.
166 - 176	$(Y_{\Lambda})_{11-1}$, subarray YSTRC, structural analysis control station coordinates along the structural reference line, created by WDDATA, in.

TABLE 226. TSEC ARRAY (CONT)

Array Location	Description
177 - 187	Not used.
188 - 198	$(\bar{Y}_o)_{lwr\ 11-1}$, subarray YBLI, assumed centroid for lower cover, similar to locations 133 - 143, in.
199 - 209	Not used.
210 - 220	Not used.
Locations 221 through 400 are used for storage of analysis constants required for metallic structural synthesis and weight analysis of both metallic and advanced composite structures. Subroutines CNSTR, SECTD, SFSCH, and TSCH, overlay (10,0), and subroutine ACNSTR, overlay (18,0), create the information stored in these locations.	
221	$K_{(b/t)f}$, stringer flange buckling coefficient factor, $(K_f/K_{skin})^{1/2}$, used for computing allowable flange b/t for metallic flanged stringers as a function of skin b/t values, initially calculated by CNSTC. TSCH revises this initial value at stress levels

TABLE 226. TSEC ARRAY (CONT)

Array Location	Description
	where plate members are critical for crippling. TSCH saves the initial value in location 255 for reset operations on exit back to SFSCH.
222	N_{fl}, constant to indicate existence of outstanding stringer flange, 0.0 for integral I-stringers, 1.0 for integral and riveted Z-stringers, created by CNSTC from input stringer-type code in D(361), input data variable STRFN.
223	N_{fu}, riveting flange indicator similar to N_{fl}, except value set to 0.0 for integral Z-stringers.
224	$(K_1)_{str}$, stringer length constant, initially computed by CNSTC as $(1 + N_{fl}\ K_{(b/t)f})$ for multirib designs (MR), $(1 + f_{min}/h_{min})$ for multispar designs (MS), and 1.0 for fulldepth honeycomb sandwich designs (FDH). Revised by TSCH when $K_{(b/t)f}$ is changed. Initial value saved in location 256.
225	$(A_{inst})_{upr}$, cross-sectional area of honeycomb panel inserts at upper cover to substructure attachment lines, calculated by CNSTC and ACNSTR from upper cover core thickness and input effective insert width, 0.0 for MR, MS plate, and FDH designs, sq in.
226	$(\bar{t}_{inst})_{upr}$, upper cover insert $\bar{t}$ for load reaction, calculated by SFSCH based on current spar spacing value, in.
227	$(\bar{t}_{core})_{upr}$, equivalent $\bar{t}$ for upper cover core for MS honeycomb panel, calculated by CNSTC as $t_{core} \cdot \rho_{core}/\rho_o$, and equivalent $\bar{t}$ for 1-inch core depth for FDH for calculation of equivalent core $\bar{t}$ at any station, calculated by CNSTC as ρ_{core}/ρ_o, 0.0 for MR and MS plates, in.
228	$\bar{t}_{bond}$, equivalent $\bar{t}$ for facesheet-to-core bonding material for two facesheets, calculated by CNSTC as ρ_{bond}/ρ_o for MS honeycomb panel and FDH, 0.0 for MR and MS plates, in.
229	$(A_{inst})_{l}$, [illegible]eycomb panel insert area for lower cover, similar to $(A_{inst}$ [illegible] in location 225, sq in.

TABLE 226. TSEC ARRAY (CONT)

Array Location	Description
230	$(\bar{t}_{inst})_{lwr}$, equivalent $\bar{t}$ for $(A_{inst})_{lwr}$, in.
231	$(\bar{t}_{core})_{lwr}$, equivalent $\bar{t}$ for lower cover core, similar to $(\bar{t}_{core})_{upr}$ in location 227, 0.0 for FDH, in.
232	$(K_{\bar{t}})_{str}$, equivalent stringer or cap $\bar{t}$ factor for load reaction calculations for MR and MS, calculated by SFSCH as [NØS/(NØS + 1.0)], and 1.0 for FDH.
233	$(K_{\bar{t}})_{rib}$, equivalent intermediate rib or spar $\bar{t}$ factor, calculated by SFSCH as 1.0 for MR, [NØS/(NØS + 1.0)] for MS, and 1.0 for FDH.
234	$(f_c)_{max\ upr\ cov}$, save location for initial value of TDC (54) variable, created by CNSTC, psi.
235	$(f_t)_{max\ lwr\ cov}$, save location for initial value of TDC(60) variable, created by CNSTC, psi.
236	$(f_t)_{max\ upr\ cov}$, save location for initial value of TDC(49) variable, created by CNSTC, psi.
237	$[(f_t)_{max}/(f_c)_{max}]_{upr\ cov}$, save location of initial value of TDC(48) variable, created by CNSTC.
238	$(f_c)_{max\ lwr\ cov}$, save location of initial value of TDC(162) variable, created by CNSTC, psi.
239	$(K_{weff})_{comp}$, effective width factor for cover compression load calculations, calculated by CNSTR as $[(W_{TB} + \Delta W_{FS} + \Delta W_{RS})/W_{TB}]$.
240	$(K_{weff})_{skin\ upr}$, effective width factor for upper cover skin weight calculations, calculated by CNSTR and ACNSTR as $[(W_{TB} + \Delta W_{skin\ FS} + \Delta W_{skin\ RS})/W_{TB}]$.
241	$(K_{weff})_{str\ upr}$, effective width factor for upper cover stringer or cap weight calculations, created by SECTD from value in location 232 and calculated by ACNSTR as [NØS/(NØS + 1.0)] for MR and MS, and 1.0 for FDH.

TABLE 226. TSEC ARRAY (CONT)

Array Location	Description
242	$(K_{weff})_{skin\ lwr}$, effective width factor for lower cover skin weight calculations, created by SECTD and ACNSTR from value in location 240.
243	$(K_{weff})_{str\ lwr}$, effective width factor for lower cover stringer or cap weight calculations, created by SECTD and ACNSTR from value in location 241.
244	$(K_{weff})_{ten}$, effective width factor for cover tension load calculations, net section load, calculated by SFSCH for upper cover analysis and SECTD for lower cover analysis as $[(W_{TB} + \Delta W_{FS} + \Delta W_{RS} - \Sigma\Delta W_{hole})/W_{TB}]$, where $\Sigma\Delta W_{hole}$ = total effective width loss due to cover to stringer and/or spar attachments.
245	Not used.
246	Not used.
247	Not used.
248	$(b/t)_{h\ cr}$, variable BØTHR, critical b/t for stringer web, calculated by TSCH from smaller value of plate buckling b/t and crippling b/t.
249	$(b/t)_{f\ cr}$, variable BØTFR, critical b/t for stringer flange, calculated by TSCH from smaller value of plate buckling b/t and crippling b/t.
250	$(b/t)_{h\ ccr}$, variable BØTHC, critical stringer web b/t for crippling criteria, calculated by TSCH.
251	$(b/t)_{f\ ccr}$, variable BØTFC, critical stringer flange b/t for crippling criteria, calculated by TSCH.
252	$(C_e)_h$, variable CCRSH, web crippling coefficient, created by CNSTC.
253	$(C_e)_f$, variable CCRSF, flange crippling coefficient, created by CNSTC.

TABLE 226. TSEC ARRAY (CONT)

Array Location	Description
254	$(E/f_{cy})^{2/3}$, material constant for crippling equation, created by CNSTC.
255	$K_{(b/t)f}$, save location for initial value of TSEC(221) variable, created by TSCH.
256	$(K_1)_{str}$, save location for initial value of TSEC(224) variable, created by TSCH.
257	$(L_{min})_{str}$, save location for initial value of TWT(305) variable, created by TSCH.
258	$(b/t)_{max}$, save location for initial value of TWT(307) variable, created by TSCH.
259	$(A_{str})_{min}$, save location for initial value of TDC(194) variable, created by TSCH.
260	D_{att}, fastener diameter for $(K_{weff})_{ten}$ calculations by SFSCH for upper cover design, in.
261	$(K_{weff})_{comp}$ W_{TB}, effective upper cover structural width for compression loads, calculated by SFSCH for calculations of $(K_{weff})_{ten}$.
262	$(K_{tsk})_{min}$, save location for initial value of variable TKKMN, TDC(64), created by SFSCH. Initially used by CNSTC for shear-tie material constant calculations, $\rho_{shear\text{-}tie}$, density for shear-tie material lb/cu in.
263	$(K_{tsk})_{max}$, save location for initial value of variable TKKMX, TDC(65), created by SFSCH. Initially used by CNSTC for shear-tie material constant calculations, f_{CY}, compression yield stress for shear-tie material, psi.
264	f_{TU}, ultimate tension stress for shear-tie material, calculated by CNSTC, psi.
265	f_{SU}, ultimate shear stress for shear-tie material, calculated by CNSTC, psi.

TABLE 226. TSEC ARRAY (CONCL)

Array Location	Description
266	f_{BRU}, ultimate bearing stress for shear-tie material, calculated by CNSTC, psi.
267	C_1, coefficient for shear-tie weight equation, computed by CNSTC as function of specified shear-tie to reference material properties.
268	C_2, coefficient for shear-tie weight equation computed by CNSTC as for C_1.
269	Not used.
270	$(K_1)_{FS}$, length correction factor for front spar weight calculations, calculated by CNSTC as function of sweep angle of front spar and structural reference lines.
271	$(K_1)_{RS}$, length correction factor for rear spar weight calculations, calculated by CNSTC as function of sweep angle of rear spar and structural reference lines.
272 - 300	Not used.

TABLE 227. TSS ARRAY, SUBROUTINES SFSCH AND TSCH

General information for array TSS: Blank common reference location = T(1961) Array size = 100 cells Array TSS is used by the metallic structural synthesis routines for storage and retrieval of parameter values during the numerical search computations for optimization of compression covers and support structures. TSS locations used by subroutines SFSCH and TSCH are described in this table. Locations 13 through 40, used by subroutine STRIB during the same sequence of calculations, are described in Table 228. Subroutine STWEB also uses array TSS, Table 229, after completion of cover analysis.	
Array Location	Description
Locations 1 through 12 contain the primary search parameter values for the second and third optimization levels controlled by subroutines SFSCH and TSCH, overlay (10,0). Locations 1 through 6 include three specified t_{skin} values and corresponding values of computed $\Sigma\bar{t}$ for the t-skin optimization of subroutine TSCH. Locations 7 through 12 contain f_c and $\Sigma\bar{t}$ values for the stress level optimization of subroutine SFSCH. These 6-cell sets are specified to subroutine CG3P for parabolic curve fit/ minimum value evaluation to determine the optimum value of t_{skin} or f_c. Subroutine TSCH data in locations 1 through 6 are computed for multirib designs only. Only one value for t_{skin} is evaluated for multispar or fulldepth honeycomb sandwich designs.	
1	$\Sigma\bar{t}_1$, total $\bar{t}$, sum of cover, supports, and miscellaneous item t-bars (from TSC(363)), for $(t_{skin})_1$, in.
2	$\Sigma\bar{t}_2$, total $\bar{t}$ for $(t_{skin})_2$, in.
3	$\Sigma\bar{t}_3$, total $\bar{t}$ for $(t_{skin})_3$, in.
4	$(t_{skin})_1$, first-point skin gage value for current set of 3-t_{skin} values, subroutine TSCH optimum t-skin search for specified value of f_c in TSC(381) and b in TSC(2), in. Computed data associated with this point, stored in TSC(383) - TSC(412), are saved in one of three 30-cell blocks, starting at TSC(261), TSC(291), and TSC(321). Variable LT1, ND(26), is used by TSCH to identify the location of the $(t_{skin})_1$ data set.

TABLE 227. TSS ARRAY, SUBROUTINES SFSCH AND TSCH (CONT)

Array Location	Description
5	$(t_{skin})_2$, second-point skin gage value for current 3-t_{skin} set, in. Variable LT2, ND(27), identifies location of saved data set. (Refer to discussion for location 4.)
6	$(t_{skin})_3$, third-point skin gage value for current 3-t_{skin} set, in. Variable LT3, ND(28), identifies location of saved data set. (Refer to discussion for location 4.)
7	$\Sigma\bar{t}_1$, total $\bar{t}$ for $(f_c)_1$, $\Sigma\bar{t}$ for optimum t_{skin} resulting from TSCH t-skin optimization search, in.
8	$\Sigma\bar{t}_2$, total $\bar{t}$ for $(f_c)_2$, in.
9	$\Sigma\bar{t}_3$, total $\bar{t}$ for $(f_c)_3$, in.
10	$(f_c)_1$, first-point stress value for current set of 3-f_c values, subroutine SFSCH optimum f_c search for specified value of b in TSC(2), psi. Computed data associated with this point, stored in TSC(381)-TSC(415), are saved in one of three 35-cell blocks, starting at TSC(121), TSC(156), and TSC(191). Variable LF1, ND(42), is used by SFSCH to identify the location of the $(f_c)_1$ data set.
11	$(f_c)_2$, second-point stress value for current 3-f_c set, psi. Variable LF2, ND(43), identifies location of saved data set. (Refer to discussion for location 10.)
12	$(f_c)_3$, third-point stress value for current 3-f_c set, psi. Variable LF3, ND(44), identifies location of saved data set. (Refer to discussion for location 10.) This point represents the first of the 3-point sets evaluated by SFSCH. Location 12 is used by SFSCH during the initial computations for $(f_c)_{max}$, TSC(3), and starting value for the f_c search, TSS(67), and also during the secondary searches for largest f_c value that will result in an acceptable design based on evaluations by subroutines TSCH, STBAR, STRG, and/or STRIL, current search $(f_c)_{max}$, TSC(3).

Locations 13 through 40 are not used by subroutines SFSCH or TSCH. These locations contain current analysis point rib or spar web data computed and used by subroutine STRIB during the optimization analysis by SFSCH and TSCH. (Refer to Table 228.)

TABLE 227. TSS ARRAY, SUBROUTINES SFSCH AND TSCH (CONT)

Array Location	Description
13-40	Subroutine STRIB variables. (Refer to Table 228.)
Locations 41 through 57 contain search constants and search parameter limiting values computed and used by subroutine TSCH. Values in locations 41, 42, 49, and 57 are computed differently for multirib, multispar, and full-depth honeycomb sandwich designs. They are also dependent upon the t-skin analysis specified for TSCH by the value of control code IDSK, ND(51): 1 = strength optimization analysis, 2 = strength analysis with required flutter skin gage specified, and 3 = strength analysis with t-skin value specified through input data array DTSKU, D(743)-D(753). (NOTE: Currently, the value of IDSK is limited to 1 or 2 by subroutines CNSTR, SECTD, and VFCAL - referenced as variable IVF. However, TSCH contains the necessary logic for this option. T-skin values input through array DTSKU are processed into D(370), variable SKMN, by subroutine CNSTR and used by the analysis routines as the current station value for minimum skin gage.	
41	$(t_{skin})_{min}$, minimum skin gage for current analysis defined by $(f_c)_i$ in TSC(381), and b_i in TSC(2), in. For multirib designs (MR), the strength optimization analysis (ST/OPT) value is computed as the maximum value of (1) minimum skin gage defined by variable SKMN, (2) skin gage required for buckling stability, $t_{skin} = b_i/(b/t)_{skin}$, and (3) skin gage based on specified minimum skin gage-to-$\bar{t}$ ratio, $t_{skin} = (K_{skin})_{min} \cdot \bar{t}_i$, where K_{skin} is the value specified in D(365). The flutter analysis (VF) value is computed as the maximum value of the preceding items 1 and 3 plus the required flutter skin gage $(t_{skin})_{VF}$. This value for strength optimization with input skin gage analysis (ST/IN) is set to the input value defined by variable SKMN. For multispar designs (MS), this value is set to $(\bar{t} - \bar{t}_{cap})$ for ST/ØPT and ST/IN. The input value can be treated only as a minimum value for MR-ST/IN because if b, N_x, and A_{cap} are specified, there is only one solution for t_{skin}. In VF analysis, this value is set to $(t_{skin})_{VF}$. For fulldepth honeycomb sandwich design (FDH), the ST/ØPT and ST/IN value is set to $\bar{t}_i$, TSC(385); to $(t_{skin})_{VF}$ for VF analysis.

TABLE 227. TSS ARRAY, SUBROUTINES SFSCH AND TSCH (CONT)

Array Location	Description
42	$(t_{skin})_{max}$, maximum skin gage for current analysis point, in. MR analysis: $(K_{skin})_{max} \cdot \bar{t}_i$ for ST/OPT where K_{skin} is the maximum skin-to-$\bar{t}$ ratio specified in D(366); input value for for ST/IN. MS and FDH analysis: set equal to $(t_{skin})_{min}$ for the three analysis types.
43	$(A_{str})_{min}$, minimum stringer or cap area for MR and MS, from TDC(94), not used in FDH analysis, sq in. In the MR analysis, subroutine TSCH recomputes this value if ratio t_{str}/t_{skin} is less than the value of variable STRSK, D(455), minimum stringer gage-to-skin gage for designs with buckling critical skins. Subroutine STRGØ also recomputes this value if the allowable web buckling (b/t), TSC(410), is less than the initial value of $h_{str}/(t_{str})_{min}$ computed by TSCH and stored in TWT(307).
44	$(t_{str})_{min}$, minimum stringer or cap gage, initially derived from input variable STRMN, D(371), by TSCH and change by TSCH and STRGØ when $(A_{str})_{min}$ is changed. (Refer to location 43.) Not used in FDH analysis in.
45	$(h_{str})_{min}$, minimum stringer height or cap width, initially derived from input variable HSTMN, D(377), by TSCH. Not used in FDH analysis, in.
46	$(f_u)_{min}$, minimum stringer riveting flange or cap flange width, computed by TSCH as the larger value of input variable STFMN, D(384), or $K_{(b/t)_f} \cdot (h_{str})_{min}$, for riveted Z-stringer or MS designs only, 0.0 for integral I- and Z-stringers. Not used for FDH designs, in.
47	$(f_L)_{min}$, minimum stringer outstanding flange or cap flange width, value computed by TSCH as described for $(f_u)_{min}$, but for riveted and integral Z-stringers or MS designs, 0.0 for integral I-stringers. Not used for FDH designs, in.

TABLE 227. TSS ARRAY, SUBROUTINES SFSCH AND TSCH (CONT)

Array Location	Description
48	$(\Delta t_{sk})_o$, search interval for t_{skin}, computed as $(t_{skin})_{max}$ - $(t_{skin})_{min}$ by TSCH for MR analysis only, set to 0.0 for MS and FDH analysis, in. For ST/ØPT and VF analysis, a negative value causes TSCH to reject the current stress value $(f_c)_i$ and returns control to subroutine SFSCH, specifying f_c too large, value of 2 for status code ISK1, ND(45). For ST/IN analysis, TSCH sets this value to 0.0 if the current $(f_c)_i$ value is valid, indicating that no t_{skin} search is to be made; however, the preceding rejection procedure is used if the skin gage required for buckling is greater than the input value.
49	$(t_{sk})_o$, starting value for skin gage search, first t_{skin} value to be analyzed by subroutine STBAR at $b_i,(f_c)_i$ for MR, only t_{skin} value analyzed by STBAR at $b_i,(f_c)_i$ for MS and FDH designs. Same value as in location 41, in.
50	$\Sigma\bar{t}_o$, total section $\bar{t}$ for $(t_{sk})_o$ only if the analysis status code returned by subroutine STBAR indicates an acceptable design, value of 1 or 2 for variable IL2, ND(33). Not used if design is unacceptable, IL2 = 3 or 4, MR analysis only, in. Computed data for $(t_{sk})_o$ stored in TSC(383) - TSC(412) are saved in locations 69 through 98.
51	$(\Delta t_{sk})_o/10.0$, search increment for skin gage, MR analysis only, in.
52	$(t_{sk})_{max}$, maximum skin gage for t_{skin} search, initially set equal to $(t_{skin})_{max}$ for MR analysis only, in. Used in TSCH logic to indicate approximate value of t_{skin} where valid designs cannot be computed by subroutine STBAR. Initial value reduced by secondary search loops when a t_{skin} point, $(t_{skin})_{min} + n\ (\Delta t_{sk})_o/10.0$, n = 1, 10, results in an unacceptable design.
53	$(t_{skin})_{opt\ 1}$, skin gage value where initial optimum $\Sigma\bar{t}$ is found, MR analysis only, in.

TABLE 227. TSS ARRAY, SUBROUTINES SFSCH AND TSCH (CONT)

Array Location	Description
54	$(\Sigma\bar{t})_{opt\ 1}$, computed value of $\Sigma\bar{t}$ at $(t_{skin})_{opt\ 1}$, used for final selection of optimum point, MR analysis only, in. If evaluation of computed minimum point $(t_{skin})_{opt\ 1}$ results in an acceptable design, total $\bar{t}$ values for the four existing points $\Sigma\bar{t}_1$, $\Sigma\bar{t}_2$, $\Sigma\bar{t}_3$, and $\Sigma\bar{t}_o$ are used to select $(t_{skin})_{design}$ for return to subroutine SFSCH. Computed data for $(t_{skin})_{opt\ 1}$ stored in TSC(383) - TSC(412) are saved in TSC(351) - TSC(380).
55	$(t_{skin})_{opt\ 2}$, skin gage value resulting from second optimum search about the initial optimum point, MR analysis only, in. $\Sigma\bar{t}$ computed for this point and compared with $(\Sigma\bar{t})_{opt\ 1}$ for selection of optimum t_{skin}. If $(t_{skin})_{opt\ 2}$ results in an unacceptable design, $(t_{skin})_{opt\ 1}$ is selected and compared with points 1, 2, and 3.
56	Not used.
57	$(t_{skin})_{(b/t)}$, skin gage required for local stability, $b_i/(b/t)_{skin}$ for ST/ØPT and ST/IN analysis for MR, in. Changed to $(\bar{t}_i - \bar{t}_{cap})$ for MS ST/ØPT and ST/IN analysis. Not required for FDH. For VF analysis set to $(t_{skin})_{VF}$ value computed by SECTD and stored in location 99, applicable to all designs.

Locations 58 through 68 contain search parameter values computed and used by subroutine SFSCH. Locations 58 through 63 are required for MR analysis only; used during secondary searches for valid stress levels when analysis code IØ2, ND(46), indicates rib spacing less than required, IØ2 = 3, or available stringer area is too small, less than minimum size, IØ2 = 2. A lower stress level is computed by interpolation based on computing calculated to required ratios for assumed values of f_c.

58	R_1, for IØ2 = 2, ratio of allowable to minimum rib spacing and for IØ2 = 3, ratio of available to minimum stringer area for f_{c1} in location 61.
59	R_2, same as R_1 except for f_{c2} in location 62.

Array Location	Description
60	R_3, same as R_1 except for f_{c3} in location 63.
61	f_{c1}, first stress level point for secondary stress level search for acceptable rib spacing or stringer area, psi. This point is always a stress value that results in an acceptable design; i.e., R_1 larger than 1.0.
62	f_{c2}, second stress level for secondary search, psi. R_2 for this point is always greater than 1.0, but less than R_1.
63	f_{c3}, third stress level for secondary search, psi. R_3 for this point is always less than 1.0.
64	$(f_c)_{opt\ 1}$, stress level where initial optimum $\Sigma\bar{t}$ is found. MR analysis only, psi.
65	$(\Sigma\bar{t})_{opt\ 1}$, computed value of $\Sigma\bar{t}$ for $(f_c)_{opt\ 1}$, in. Computed data stored in TSC(381) - TSC(415) are saved in TSC(226) - TSC(260).
66	$(f_c)_{opt\ 2}$ stress level resulting from second optimum search about the initial optimum point. MR analysis only, psi. $\Sigma\bar{t}$ computed for this point and compared wit.. $(\Sigma\bar{t})_{opt\ 1}$ for selection of design point.
67	$(f_c)_o$, starting value for stress level search, psi. This value will be equal to or less than the initial value of the current maximum stress stored in TSC(3), used to initialize TSS(12) for evaluation of the first stress level point. The value in this location is not changed during the search; however, the value in TSC(3) is always reduced when evaluated points result in unacceptable design.
68	Δf_c, stress level increment for search between the starting stress value and $(f_c)_{max}$, TSC(3), when optimum search is directed to a larger value than $(f_c)_{start}$, TSS(12), and if $(f_c)_{start}$ is less than $(f_c)_{max}$, $0.10 \cdot \left[(f_c)_{max} - (f_c)_{start}\right]$. For MR analysis only, psi.

TABLE 227. TSS ARRAY, SUBROUTINES SFSCH AND TSCH (CONCL)

Array Location	Description
Locations 69 through 98 contain the saved design data block for the first optimum point, $(t_{skin})_{opt\ 1}$, resulting from the t_{skin} search of subroutine TSCH, computed at a specified stress level, $(f_c)_i$, stringer spacing, b_i and load level $(N_x)_i$.	
69-98	Computed data from TSC(383) - TSC(412) for $(t_{skin})_{opt\ 1}$, TSS(53).
99	$(t_{VF})_i$, required skin gage for flutter analysis. Computed by subroutine SECTD, and used by subroutines SFSCH and TSCH only during the flutter analysis pass, 2.0 value for code word IVF, ND(51), in.
100	(b/t) at $(t_{skin})_{min}$ or $(t_{VF})_i$ and (f_c) for the stored value of b/t, computed by subroutine SFSCH for MR analysis only. (b/t) value specified to subroutine BOT for computation of f_c; 1.0 for BOT analysis code IKI, ND(32).

TABLE 228. TSS ARRAY, SUBROUTINE STRIB

General information for array TSS:

Blank common reference location = T(1961)

Array size = 100 cells

Array TSS is used as a common storage and retrieval array by synthesis routines for metallic structure. Locations 13 through 40 only are used by subroutines STRIB and SRRIB. The other locations are used by subroutine SFSCH and TSCH. Subroutine STRIB uses TSS array locations during computations of intermediate rib webs for multirib designs and intermediate spar webs for multispar designs. Subroutine STRIB is not used in the analysis of fulldepth honeycomb sandwich designs.

Array Location	Description
1-12	Used by subroutines SFSCH and TSCH, see Table 227.
Locations 13 through 18 are used by STRIB during each of the two interpolation loops; first, to determine gage required for column support (multirib designs only), and second, to determine web gage required for flexure-induced column loads.	
13	f_1, assumed stress level point 1 for support stiffness search, psi, or $(t_w)_1$, assumed web gage point 1 for column stability search, in.
14	f_2, point 2 stress level, psi, or $(t_w)_2$, point 2 web gage, in.
15	f_3, point 3 stress level, psi, or $(t_w)_3$, point 3 web gage, in.
16	r_1, $(t_w)_{p/a}/(t_w)_{stiff}$ at f_1, computed by STRIB, or f_c/f_{ccr} at $(t_w)_1$. Set up by STRIB from value computed by SRRIB, and stored in location TSS(40).
17	r_2, web ratio for f_2 or stress ratio for $(t_w)_2$.
18	r_3, web ratio for f_3 or stress ratio for $(t_w)_3$.
Locations 19 through 23 are used by SRRIB during computations of critical local and general instability stresses for specified web gages.	
19	$(f_c)_i$, applied compression stress, psi.
20	$(E_T)_i$, tangent modulus for $(f_c)_i$, psi.

TABLE 228. TSS ARRAY, SUBROUTINE STRIB (CONT)

Array Location	Description
21	$(f_{ccr})_i$, critical stability stress. Smaller of the local and general stability stresses calculated and stored in TSS(38) and TSS(39), psi.
22	R_i, corrugated web radius, computed value between input minimum value CØRMN, D(403), and maximum value, CØRMX, D(404), in.
23	$(t_w)_i$, specified web gage for SRRIB analysis, in.
Locations 24 through 37 contain web analysis data computed and used by STRIB.	
24	Δt_w, web gage increment for stability search. Smaller of input value in D(406), variable DELTW, and initial point gage, in.
25	P_i, compression load on web column, lb/in.
26	K_t, constant for corrugation radius calculations, ratio of local to general stability constants times the square of the web column height, $K_L/K_G(h_w)^2$, in.^{2}
27	K_{fg}, constant for general stability stress, $K_G/(h_w)^2$, in.$^{-2}$
28	$(t_w)_{min}$, minimum web gage, from D(372), variable RBMG, in.
29	$(t_w)_{stiff}$, web gage for support stiffness, initially gage at proportional limit stress, changed to gage at the design stress level stress for support requirements, in.
30	$(t_w)_{cy}$, web gage for strength, (P/A), at yield stress, in.
31	$(h_w)_i$, effective column height for web, in.
32	K_{stiff}, constant for web stiffness gage calculations, lb/in.
33	$(t_w)_{P/A}$, web gage for strength, (P/A), at proportional limit stress, in.
34	Not used.
35	$(t_w)_{stiff\ cy}$, web gage for support stiffness at yield stress, in.
36	$((t_w)_{P/A})_i$, P/A web gage for current assumed stress level, in.
37	$((t_w)_{stiff})_i$, support stiffness web gage for current assumed stress level, in.
Locations 38 through 40 are used for SRRIB calculations.	
38	$((f_{ccr})_L)_i$, local stability stress. Calculated for specified $(t_w)_i$, TSS(23), and calculated radius, R_i, TSS(22), psi.

TABLE 228. TSS ARRAY, SUBROUTINE STRIB (CONCL)

Array Location	Description
39	$((f_{ccr})_G)_i$, general stability stress, for $(t_w)_i$ and R_i, psi.
40	r_i, ratio of applied to allowable stress.
41-100	Used by subroutines SFSCH and TSCH. (Refer to Table 227.)

TABLE 229. TSS ARRAY, SUBROUTINE STWEB

General information for array TSS:

Blank common reference location = T(1961)

Array size = 100 cells

Array TSS is used by subroutine STWEB for storage and retrieval of front and rear spar strength analysis data. This array is used during the plate-stiffenened web analysis of each spar after compression cover analysis has been completed. Array locations are not set to 0.0 values before use by STWEB; data computed during the cover analysis stored in locations 1 through 36 only are replaced with STWEB data. The remaining data items are not changed. (Refer to Tables 227 and 228.) Spar data stored in locations 4 through 9 are moved by subroutine SECTD to the station summary data block in array TDC, locations 179 through 184 for front spar, and 186 through 191 for rear spar. If the specified web shear load at any station has a value of 0.0, the current station requirements are set equal to that computed for the adjacent outboard station, except for the tip station, where minimum web gage is used. Values for locations 1 through 12, 20, and 29 only are computed for zero shear condition.

Array Location	Description
1	D_{eff}, effective depth of spar web, in.
2	A_{web}, cross-sectional area of web plus stiffeners, sq in.
3	D_i, mold line depth of spar, in.
4	ΣA_{spar}, total cross-sectional area of spar, sq in.
5	$(t_w)_{spar}$, spar web gage, in.
6	$(A_{cap})_{spar}$, cross-sectional area of upper and lower spar caps, sq in
7	b_{stiff}, stiffener spacing, input value for D(420) or D(421), input data array SWBST, in.
8	$(f_s)_{spar}$, spar web shear stress, psi.
9	$f_{scr})_{spar}$, spar web critical shear stress, psi.
10	$(f_s)_{max}$, spar web shear stress cutoff value, value from TWT(171) or TWT(172), computed by subroutine CNSTC from material f_{SU} and/or input cutoff factor/stress in D(412) or D(413), input data array SFSRS, psi.

Array Location	Description
11	V_{spar}, shear load on spar, lb (ult).
12	K, constant for critical clear stress equation, $\left[K_E \cdot F_{cov}/(1 - \mu^2)\right]$, psi.
Locations 13 through 18 are used for storage of web gage search parameter values computed and used by STWEB to determine the optimum spar web gage. Locations 13 through 15 are also used during interpolation for flat plate shear buckling coefficient based on panel aspect ratios, using tabular values of b/a and associated K from D(550) through D(571), input data array DKS.	
13	$(t_w)_1$, assumed web gage point 1 for spar web analysis, in. Also, $\Delta(b/a)$ from shear buckling coefficient table.
14	$(t_w)_2$, assumed web gage point 2, in. Also, ΔK from shear buckling table.
15	$(t_w)_3$, assumed web gage point 3, in. Also, $(b/a)_{reqd} - (b/a)_i$.
16	r_1, ratio of applied to allowable shear stress for $(t_w)_1$. Value setup by STWEB from data computed and stored in location 22 by subroutine SKWEB.
17	r_2, same as r_1 for $(t_w)_2$.
18	r_3, same as r_1 for $(t_w)_3$.
Locations 19 through 36 contain spar web analysis data computed and or used by STWEB and SKWEB.	
19	$(f_s)_i$, applied clear stress for web gage in location 23, variable TI, computed by SKWEB, psi.
20	$(t_{cap})_{equiv}$, equivalent gage for spar cap, A_{calc}/L_{cap}, used for minimum gage tests, computed and used by STWEB, in.
21	$(F_{scr})_i$, allowable shear stress for $(t_w)_i$, computed by SKWEB, psi.
22	r_i, ratio of applied to allowable shear stress computed by SKWEB as variable RI.
23	$(t_w)_i$, web gage for current analysis point, variable TI, subroutine SKWEB, in.
24	Δt_w, web gage increment for search, computed by STWEB from largest value of $(t_w)_{min}/2.0$, $(t_w)_0/5.0$ and input Δt_w, variable DELTW, D(422), in.
25	q_{web}, web shear, lb/in.

TABLE 229. TSS ARRAY, SUBROUTINE STWEB (CONCL)

Array Location	Description
26	K_1, shear buckling coefficient, computed by STWEB as a function of panel aspect ratio, (b/a), used in Equation 51.
27	K_s, shear buckling coefficient for combined shear and bending on web, computed by SKWEB as a function of applied shear stress and peak compression stress, used in Equation 52. The critical shear stress from Equation 52 can affect the web gage size if DKS(24), D(573) is input with a value of 1.0. The current default value of 100.0 results in higher allowables than for the pure shear allowable computed from Equation 51.
28	$(t_w)_o$, starting thickness for web gage search, in.
29	$(t_w)_{min}$, minimum web gage, from input value in D(373) or D(374), input data array SWBMG, in.
30	$(t_w)_{fsmax}$, web gage based on $(f_s)_{max}$, location 10, in.
31	b_{web}, short dimension for web aspect ratio (b/a), shorter of web depth, TSS(1), and stiffener spacing, TSS(7), in.
32	$(f_c)_{web}$, peak bending stress on web, based on cover design stress and ratio of web to average box depth, psi.
33	K_b, constant terms for critical shear stress calculations using Equation 51, used to compute initial web gage required for pure shear, lb/in^4.
34	K_D, constant term for critical shear stress calculations using Equation 52, used by SKWEB during t_w search for webs under shear and bending loads, lb/in^4.
35	a_{web}, long dimension for web aspect ratio (b/a), larger of web depth or stiffener spacing, in.
36	$(b/a)_{web}$, panel aspect ratio of web used to determine shear buckling coefficient K_1.
37-100	Not used. Values computed by subroutines SFSCH, TSCH, and STR1B. (Refer to Tables 227 and 228.)

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS

General information for array TWT:

Blank common reference location = CD(1101)

Array size = 400 cells

Array TWT is used for storage of calculated weight data by the weight analysis routines for metallic and advanced composite designs in locations 1 through 162 and 185 through 250; storage of weight analysis constants and coefficients, locations 166 through 184 and 257 through 280; and storage of intermediate calculation data, locations 163, 164, and 281 through 330. Outer panel component and torque-box element weight summary information processed and printed by subroutines WØDATA and PRTD of overlay (17,0) are based on information computed and stored in locations 1 through 72 by subroutine WTCAL of overlays (10,0) and (18,0). Station panel and accumulated weight data in locations 1 through 123, 145 through 153, and 185 through 230 are printed by subroutine PRTC of overlays (10,0) and (18,0) under control of internal print control word IPB. Stiffness calculation data for metallic designs in locations 282 through 300 resulting from the strength-only analysis pass are printed by subroutine PRTB, while the data set for the flutter analysis pass is printed by subroutine PRTC, both under control of IPB. Subroutine EIGJC saves the strength-only data set in CD(1855) - CD(1872) for the subsequent print by PRTB.

Subroutine VFCAL is used for flutter stiffness requirement analysis of metallic design. Locations 57 through 96 are used by VFCAL for section stiffness analysis after strength-only analysis to provide the necessary web requirement information for the subsequent strength plus flutter requirement synthesis pass. Subroutine WTCAL subsequently uses these locations for weight analysis calculations. The WTCAL variables are described first; the VFCAL variables are defined as the last block in this table. This VFCAL data set is created only during metallic analysis. It is printed by subroutine PRTB under control of IPB only of flutter stiffness requirements are evaluated and only for stations that are flutter stiffness critical.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
Locations 1 through 72 contain outer-panel and torque-box summary weight data computed by subroutine WTCAL in terms of accumulated weight of all applicable structures outboard of the current analysis station. Subroutine CNSTR, overlay (10,0) for metallic designs, and ATBØPT, overlay (18,0) for advanced composite designs, further process these weight items before processing of data for overlay (17,0) by subroutines TBØPT, overlay (9,0), and ATBØPT, overlay (18,0). Data in locations 1 through 59 and 145 through 149 for the root section are printed under control of internal print control word IPA by subroutines PRTA, overlay (9,0), and ACPRTA, overlay (18,0). Weight summary at station J (refer to Table 237 for description), consisting of identical data, is also printed by subroutine PRTA for metallic designs. This data set is saved by subroutine CNSTR, overlay (10,0), in TW(801) - TW(900) for use by TBØPT and output print by PRTA. Data items are computed and used as pounds per side by subroutines WTCAL, CNSTR, and ACNSTR, and pounds per air vehicle by TBØPT and ATBØPT.	
1	ΣW_{TB}, total torque-box weight, lb/side or lb per A/V.
2	$(\Sigma W_{cov})_{upr}$, total upper cover weight, lb/side or lb per A/V.
3	$(\Sigma W_{cov})_{lwr}$, total lower cover weight, lb/side or lb per A/V.
4	$(\Sigma \Delta W_{TB})_{VF}$, total torque-box weight increment for flutter design, lb/side or lb per A/V.
5	ΣW_{rib}, total intermediate rib or spar weight, lb/side or lb per A/V.
6	ΣW_{FS}, total front spar weight, lb/side or lb per A/V.
7	ΣW_{RS}, total rear spar weight, lb/side or lb per A/V.
8	ΣW_{misc}, total miscellaneous structure and attachment weight, lb/side or lb per A/V.
9	$(W_{skin})_{upr}$, upper cover skin weight, lb/side or lb per A/V.
10	$(W_{str})_{upr}$, upper cover stringer or cap weight, lb/side or lb per A/V.
11	$(W_{misc\ skin})_{upr}$, upper cover miscellaneous skin weight, lb/side or lb per A/V.
12	$(W_{skin})_{lwr}$, lower cover skin weight, lb/side or lb per A/V.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
13	$(W_{str})_{lwr}$, lower cover stringer or cap weight, lb/side or lb per A/V.
14	$(W_{misc\ skin})_{lwr}$, lower cover miscellaneous skin weight, lb/side or lb per A/V.
15	$(W_{cap})_{FS}$, front spar cap weight, lb/side or lb per A/V.
16	$(W_{web})_{FS}$, front spar web weight, lb/side or lb per A/V.
17	$(W_{cap})_{RS}$, rear spar cap weight, lb/ side or lb per A/V.
18	$(W_{web})_{RS}$, rear spar web weight, lb/side or lb per A/V.
19	$(\Delta W_{skin})_{upr\ VF}$, upper cover skin weight increment for flutter design, lb/side or lb per A/V.
20	$(\Delta W_{str})_{upr\ VF}$, upper cover stringer or cap weight increment for flutter design, lb/side or lb per A/V.
21	$(\Delta W_{misc\ skin})_{upr\ VF}$, upper cover miscellaneous skin weight increment for flutter design, lb/side or lb per A/V.
22	$(\Delta W_{skin})_{lwr\ VF}$, lower cover skin weight increment for flutter design, lb/side or lb per A/V.
23	$(\Delta W_{str})_{lwr\ VF}$, lower cover stringer or cap weight increment for flutter design, lb/side or lb per A/V.
24	$(\Delta W_{misc\ skin})_{lwr\ VF}$, lower cover miscellaneous skin weight increment for flutter design, lb/side or lb per A/V.
25	$(\Delta W_{rib})_{VF}$, intermediate rib or spar weight increment for flutter design, lb/side or lb per A/V.
26	$(\Delta W_{web})_{FS\ VF}$, front spar web weight increment for flutter design, lb/side or lb per A/V.
27	$(\Delta W_{web})_{RS\ VF}$, rear spar web weight increment for flutter design, lb/side or lb per A/V.
28	$(\Delta W_{att})_{VF}$, miscellaneous cover attachment weight increment for flutter design, lb/side or lb per A/V.
29	$(\Delta W_{misc})_{rib\ VF}$, intermediate rib or spar miscellaneous structure items weight increment for flutter design, lb/side or lb per A/V.
30	W_{blhd}, bulkhead weights, lb/side or lb per A/V.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
31	$(\Delta W_{skin\ chordwise})_{upr}$, upper cover skin weight increment for chordwise splices or skin pads for bulkhead attach, lb/side or lb per A/V.
32	$(\Delta W_{skin\ chordwise})_{lwr}$, lower cover skin weight increment for chordwise skin splices or skin pads for bulkhead attach, lb/side or lb per A/V.
33	$(W_{att})_{blhd}$, attachment weight for chordwise splices or bulkhead to cover attach, lb/side or lb per A/V.
34	ΔW_{rib}, weight of intermediate ribs replaced with bulkhead ribs for multirib design only, 0.0 for multispar or fulldepth honeycomb sandwich designs, lb/side or lb per A/V.
35	W_{RR}, root rib weight, calculated by subroutine RTRIB for station 1 only (root panel), 0.0 for all other stations, lb/side or lb per A/V.
36	$(W_{cap})_{RR}$, root rib cap weight, calculated by RTRIB, lb/side or lb per A/V.
37	$(W_{web})_{RR}$, root rib web weight, calculated by RTRIB, lb/side or lb per A/V.
38	$(W_{misc})_{RR}$, root rib miscellaneous structure and attachment weight, calculated by RTRIB, lb/side or lb per A/V.
39	$W_{shear\ ftg}$, outer-panel-to-fuselage shear-tie fitting weight, calculated by RTRIB, lb/side or lb per A/V.
40	$\Sigma W_{SURFACE}$, total surface weight, outer-panel and center-section, lb/side or lb per A/V.
41	ΣW_{OPNL}, total outer-panel weight, lb/side or lb per A/V.
42	Not used.
43	ΣW_{C-SEC}, total center-section weight, lb/side or lb per A/V.
44	b_{str}, stringer or spar spacing from TDC(82), for use with PRTC output print of section J and root section weight summary, particularly to indicate spacing used in optional torque-box optimization by subroutine TBØPT for metallic designs, set up by CNSTR for metallic design and ACNSTR for advanced composite designs, in.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
45	ΣW_{OPNL}, cummulative sum of outer-panel structures panel weights stored in location 61, lb/side or lb per A/V.
46	ΣW_{TB}, cummulative sum of torque-box panel weights stored in location 61, lb/side or lb per A/V.
47	ΣW_{LE}, cummulative sum of leading edge panel weights stored in location 62, lb/side or lb per A/V.
48	ΣW_{TE}, cummulative sum of trailing edge panel weights stored in location 63, lb/side or lb per A/V.
49	ΣW_{MISC}, cummulative sum of outer panel secondary structure panel weights stored in location 64, lb/side or lb per A/V.
50	W_{TIP} surface tip panel structure weight, lb/side or lb per A/V.
51	$\Delta W_{T\text{-}Tail}$, weight increment of T-tail provisions for horizontal or vertical tail if T-tail design, currently 0.0, values not calculated, lb/side or lb per A/V.
52	$\Sigma \Delta W_{VF}$, cummulative sum of weight increment for flutter design, panel weights stored in location 65, lb/side or lb per A/V.
53	$\Sigma \Delta W_{CDL}$, cummulative sum of structural provision weights for concentrated masses, panel weights stored in location 108, lb/side or lb per A/V.
54	W_{RR}, total root rib weight, root station only, lb/side or lb per A/V.
55	$\Sigma W_{pnl\ o}$, total weight of structures inboard of root panel, sum of root rib, T-tail provisions at the root panel, weights of leading or trailing edge structures inboard of the structural chord for analysis station 1 and associated secondary structure weight computed as a fraction of these weights, lb/side or lb per A/V.
56	$(W_{TB})_{pnl\ o}$, sum of root rib and T-tail provisions at root station, lb/side or lb per A/V.
57	$(W_{LE})_{pnl\ o}$, leading edge structure weight inboard of structural chord of root station, lb/side or lb per A/V.
58	$(W_{TE})_{pnl\ o}$, trailing edge structure weight inboard of structural chord of root station, lb/side or lb per A/V.
59	$(W_{MISC})_{pnl\ o}$, secondary structure weight based on weights of items assumed to be in inboard panel o, lb/side or lb per A/V.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
Locations 60 through 65 contain outer panel component weights for the current panel, including tip panel data computed during the analysis for structural station 11.	
60	ΣW_{pnl}, total weight for current panel, lb/side.
61	$(W_{TB})_{pnl}$, torque-box weight for current panel, lb/side.
62	$(W_{LE})_{pnl}$, leading edge weight for current panel, lb/side.
63	$(W_{TE})_{pnl}$, trailing edge weight for current panel, lb/side.
64	$(W_{MISC})_{pnl}$, secondary structure weight for current panel, lb/side.
65	$(\Delta W_{VF})_{pnl}$, flutter design weight increment for current panel, lb/side.
Locations 66 through 72 contain weight increment data for T-tail configurations. Currently, data for these items are not computed. Locations 66, 67, and 70 are currently used by WTCAL for temporary T-tail calculations.	
66	$\Sigma \Delta W_{T\text{-}tail}$, total weight increment for T-tail provisions, lb/side.
67	$(\Sigma \Delta W_{rib})_{T\text{-}tail}$, total weight increment for rib structures for T-tail horizontal and vertical tail surfaces, lb/side.
68	$(\Delta W_{rib})_{T\text{-}tail\ HORZ}$, weight increment for root panel of T-tail horizontal tail surface, lb/side.
69	$(\Delta W_{rib})_{T\text{-}tail\ VERT}$, weight increment for tip panel of T-tail vertical tail surface, lb/panel.
70	$(\Sigma \Delta W_{cone})_{T\text{-}tail}$, total weight for tail cone, lb/side.
71	$(\Delta W_{cone})_{T\text{-}tail\ HORZ}$, tail cone weight for T-tail horizontal tail surface, lb/side.
72	$(\Delta W_{cone})_{T\text{-}tail\ VERT}$, tail cone weight for T-tail vertical tail surface, lb/panel.
Locations 73 through 96 contain torque-box structural element weights for the current panel computed from cross-sectional areas computed for the current station, locations 121 through 144, and areas for the previous station saved in locations 227 through 250.	

TABLE 250. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
73	$(W_{skin})_{upr}$, upper cover skin weight, lb/panel.
74	$(W_{skin})_{lwr}$, lower cover skin weight, lb/panel.
75	W_{rib}, intermediate rib or spar weight, lb/panel.
76	$(W_{str})_{upr}$, upper cover stringer or cap weight, lb/panel.
77	$(W_{str})_{lwr}$, lower cover stringer or cap weight, lb/panel.
78	$(W_{misc\ skin})_{upr}$, upper cover miscellaneous skin weight, lb/panel.
79	$(W_{misc\ skin})_{lwr}$, lower cover miscellaneous skin weight, lb/panel.
80	W_{att}, miscellaneous structural attachment weight, lb/panel.
81	$(W_{misc})_{rib}$, miscellaneous rib or spar structure weight, lb/panel.
82	$(\Delta W_{skin})_{upr\ VF}$, upper cover skin weight increment for flutter design, lb/panel.
83	$(\Delta W_{skin})_{lwr\ VF}$, lower cover skin weight increment for flutter design, lb/panel.
84	$(\Delta W_{str})_{upr\ VF}$, upper cover stringer or cap weight increment for flutter design, lb/panel.
85	$(\Delta W_{str})_{lwr\ VF}$, lower cover stringer or cap weight increment for flutter design, lb/panel.
86	$(W_{web})_{FS}$, front spar web weight, lb/panel.
87	$(W_{web})_{RS}$, rear spar web weight, lb/panel.
88	$(W_{cap})_{FS}$, front spar cap weight, lb/panel.
89	$(W_{cap})_{RS}$, rear spar cap weight, lb/panel.
90	$(\Delta W_{web})_{FS\ VF}$, front spar web weight increment for flutter design, lb/panel.
91	$(\Delta W_{web})_{RS\ VF}$, rear spar web weight increment for flutter design, lb/panel.
92	$(\Delta W_{rib})_{VF}$, intermediate rib or spar weight increment for flutter design, lb/panel.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
93	$(\Delta W_{misc\ skin})_{upr\ VF}$, upper cover miscellaneous skin weight increment for flutter design, lb/panel.
94	$(\Delta W_{misc\ skin})_{lwr\ VF}$, lower cover miscellaneous skin weight increment for flutter design, lb/panel.
95	$(\Delta W_{att})_{VF}$, miscellaneous attachment weight increment for flutter design, lb/panel.
96	$(\Delta W_{misc})_{rib\ VF}$, miscellaneous rib or spar weight increment for flutter design, lb/panel.
Locations 97 through 104 contain torque-box component weights for the current panel, computed from data stored in locations 73 through 96.	
97	ΣW_{TB}, total torque-box weight, not including local increments stored in locations 105 through 114, lb/panel.
98	$(W_{cov})_{upr}$, upper cover weight, lb/panel.
99	$(W_{cov})_{lwr}$, lower cover weight, lb/panel.
100	$(\Sigma\Delta W_{TB})_{VF}$, torque-box weight increment for flutter design, lb/panel.
101	W_{rib}, intermediate rib or spar weight, lb/panel.
102	W_{FS}, front spar weight, lb/panel.
103	W_{RS}, rear spar weight, lb/panel.
104	W_{MISC}, secondary structure weight, computed as fraction of sum of panel weights in locations 98 through 103, lb/panel.
Locations 105 through 114 contain torque-box weight increments to be added to the distributed structure weights stored in locations 97 through 104.	
105	$(\Sigma\Delta W_{TB})_{pnl}$, torque-box weight increment for the current panel, lb/panel.
106	$(\Delta W_{TB})_{\delta i}$, torque-box weight increment based on input panel weight factor, D(1088) - D(1097), input data array DTBX(1) - DTBX(10), internally stored as array DLPNL, T(177) - T(186), lb/panel.
107	$(\Delta W_{TB})_{input}$, torque-box weight increment input in D(1098) - D(1107), input data array DTBX(11) - DTBX(20), lb/panel.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
108	ΔW_{CDL}, structural provision weights for concentrated masses, lb/panel.
109	$\Sigma\Delta W_{chord\ wise}$, torque-box weight increment for chordwise splice and/or bulkhead ribs at inboard and/or outboard station of current panel, stored in locations 110 through 114, lb/panel.
110	$(W_{blhd})_{pnl}$, bulkhead weight assigned to current panel, sum of one-half of the bulkhead weights at the inboard and outboard stations, lb/panel.
111	$(\Delta W_{skin\ chordwise})_{upr}$, upper cover skin increment for chordwise splice and pads, one-half of weights at the inboard and outboard stations, lb/panel.
112	$(\Delta W_{skin\ chordwise})_{lwr}$, lower cover skin increment for chordwise splice and pads, one-half of weights at the inboard and outboard stations, lb/panel.
113	$(W_{att})_{chordwise}$, cover splice and bulkhead attachment weight increment, one-half of weights at the inboard and outboard stations, lb/panel.
114	ΔW_{rib}, weight of intermediate rib replaced by bulkhead rib, one-half of weight at the inboard and outboard stations, multirib designs only, 0.0 for multispar or fulldepth honeycomb sandwich designs, lb/panel.
Locations 115 through 120 contain torque-box component flutter design weight increments for the current panel computed from data stored in locations 73 through 96.	
115	$(\Delta W_{cov})_{upr\ VF}$, upper cover weight increment for flutter design, lb/panel.
116	$(\Delta W_{cov})_{lwr\ VF}$, lower cover weight increment for flutter design, lb/panel.
117	$(\Delta W_{rib})_{VF}$, intermediate rib or spar weight increment for flutter design, lb/panel.
118	$(\Delta W_{FS})_{VF}$, front spar weight increment for flutter design, lb/panel.
119	$(\Delta W_{RS})_{VF}$, rear spar weight increment for flutter design, lb/panel.
120	$(\Delta W_{misc})_{VF}$, miscellaneous structure and attachment weight increment for flutter design, lb/panel.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
Locations 121 through 144 contain cross-sectional areas for torque-box structural elements for the current analysis station based on sizing data resulting from the synthesis routines, overlay (10,0) for metallic designs, and overlay (18,0) for advanced composite designs. Definitions for each element are the same as those in locations 73 through 96. All areas are computed in terms of square inches of material for the structural chord.	
121	$(A_{skin})_{upr}$ sta i
122	$(A_{skin})_{lwr}$ sta i
123	$(A_{rib})_{sta}$ i
124	$(A_{str})_{upr}$ sta i
125	$(A_{str})_{lwr}$ sta i
126	$(A_{misc\ skin})_{upr}$ sta i
127	$(A_{misc\ skin})_{lwr}$ sta i
128	$(A_{att})_{sta}$ i
129	$(A_{misc})_{rib}$ sta i
130	$(\Delta A_{skin})_{upr}$ VF sta i
131	$(\Delta A_{skin})_{lwr}$ VF sta i
132	$(\Delta A_{str})_{upr}$ VF sta i
133	$(\Delta A_{str})_{lwr}$ VF sta i
134	$(A_{web})_{FS}$ sta i
135	$(A_{web})_{RS}$ sta i
136	$(A_{cap})_{FS}$ sta i
137	$(A_{cap})_{RS}$ sta i
138	$(\Delta A_{web})_{FS}$ VF sta i

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
139	$(\Delta A_{web})_{RS\ VF\ sta\ i}$
140	$(\Delta A_{rib})_{VF\ sta\ i}$
141	$(\Delta A_{misc\ skin})_{upr\ VF\ sta\ i}$
142	$(\Delta A_{misc\ skin})_{lwr\ VF\ sta\ i}$
143	$(\Delta A_{att})_{VF\ sta\ i}$
144	$(\Delta A_{misc})_{rib\ VF\ sta\ i}$
Locations 145 through 149 contain outer panel component weights for structures outboard of the tip station, analysis station 11.	
145	$\Sigma W_{OBD\ pnl}$, total weight of structures outboard of station 11, lb/side a lb per A/V.
146	$(W_{TB})_{OBD\ pnl}$, weight of structures outboard of station 11, assigned to the outer-panel torque-box, lb/side or lb per A/V.
147	$(W_{LE})_{OBD\ pnl}$, weight of leading edge structures outboard of station 11, lb/side or lb per A/V.
148	$(W_{TE})_{OBD\ pnl}$, weight of trailing edge structures outboard of station 11, lb/side or lb per A/V.
149	$(W_{MISC})_{OBD\ pnl}$, secondary structure weight for structures outboard of station 11, lb/side or lb per A/V.
Locations 150 through 153 contain skin and web gage data for strength-only design. These values are based on skin weight coefficients applied to thicknesses resulting from structural sizing data, calculated by subroutine SECTD, overlay (10,0), for metallic designs, and subroutine ACNSTR, overlay (18,0), for advanced composite designs. Skin and spar weight coefficients for metallic designs are not applied to minimum gage sizings.	
150	$(t_{skin\ eff})_{upr}$, effective upper cover skin gage for strength design, in.
151	$(t_{skin\ eff})_{lwr}$, effective lower cover skin gage for strength design, in.
152	$(t_{web\ eff})_{FS}$, effective front spar web gage for strength design in.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
153	$(t_{web\ eff})_{RS}$, effective rear spar web gage for strength design, in.
154	Not used.
155	Not used.
156	Not used.
Locations 157 through 162 contain front and rear spar element weights computed for the current panel.	
157	$(W_{cap})_{FS}$, front spar cap weight, lb/panel.
158	$(W_{web})_{FS}$, front spar web weight, lb/panel.
159	$(W_{misc})_{FS}$, miscellaneous structure and attachment weight for front spar, lb/panel.
160	$(W_{cap})_{RS}$, rear spar cap weight, lb/panel.
161	$(W_{web})_{RS}$, rear spar web weight, lb/panel.
162	$(W_{misc})_{RS}$, miscellaneous structure and attachment weight for rear spar, lb/panel.
163	Temporary storage for intermediate calculation data.
164	Temporary storage for intermediate calculation data.
Locations 165 through 184 contain current panel and torque-box material constants.	
165	ρ_{lwr}/ρ_{upr}, density ratio for lower cover weight calculations, calculated by CNSTC, overlay (16,0), for metallic analysis and set to 1.0 by subroutine ACPRØG, overlay (18,0), for advanced composite analysis.
166	ΔY_{Λ}, structural length of current analysis panel, calculated by WTCAL, in.
167	$(f_t)_{max}$, maximum allowable tension stress for splice design by subroutine BHDJT, overlays (10,0) and (18,0), set up by CNSTC for metallic analysis and ACNSTR for advanced composite analysis, psi.
168	$(f_{br})_{max}$, maximum allowable bearing stress for splice design by BHDJT, set up by CNSTC for metallic analysis and ACNSTR for advanced composite analysis, psi.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
169	$(-N_x)_{i-1}$, cover load intensity, down-bending condition for previous station, set up by WTCAL for use in metallic analysis only, lb/in.
170	$(+N_x)_{i-1}$, cover load intensity, up-bending condition for previous station, set up by WTCAL for use in metallic analysis only, lb/in.
171	$(f_s)_{max\ FS}$, maximum allowable shear stress for front spar web design by STWEB, set up by CNSTC for metallic analysis, not used in advanced composite analysis, psi.
172	$(f_s)_{max\ RS}$, maximum allowable shear stress for rear spar web design, similar to location 171, psi.
173	E_{upr}, elastic modulus of upper cover material for use in stiffness calculations by subroutine EIGJC, set up by CNSTC for metallic analysis, not used in advanced composite analysis, psi.
174	G_{upr}, shear modulus of upper cover material, similar to E_{upr}, psi
175	ρ_{upr}, density of upper cover material, variable SDHRØ, reference density for torque-box weight calculations, set up by CNSTC for metallic analysis and ACPRØG for advanced composite analysis, lb/in^3.
176	$(K_G)_{lwr}$, ratio of lower cover to upper cover shear modulus, setup by CNSTC for use in stiffness calculations, metallic analysis only.
177	$(K_G)_{FS}$, ratio of front spar web to upper cover shear modulus, similar to $(K_G)_{lwr}$.
178	$(K_G)_{RS}$, ratio of rear spar web to upper cover shear modulus, similar to $(K_G)_{lwr}$.
179	$(K_E)_{lwr}$, ratio of lower cover to upper cover elastic modulus, similar to $(K_G)_{lwr}$.
180	$(K_E)_{FS}$, ratio of front spar web to upper cover elastic modulus, similar to $(K_G)_{lwr}$.
181	$(K_E)_{RS}$, ratio of rear spar web to upper cover elastic modulus, similar to $(K_G)_{lwr}$.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
182	$(\rho_{upr} \cdot \Delta Y_{\Lambda})/2.0$, constant for panel weight calculation, lb/in.
183	(ρ_{FS}/ρ_{upr}), density ratio for front spar weight calculations, similar to location 165.
184	(ρ_{RS}/ρ_{upr}), density ratio for rear spar weight calculations, similar to location 165.
Locations 185 through 214 are used by subroutines WTCAL and BHDJT, overlays (10,0) and (18,0), for storage of skin overhang, chordwise splice, and bulkhead data.	
185	$(W_{skin\ FS/RS})_{upr}$, upper cover skin overhang material weight at the front and rear spars for current panel, lb/panel.
186	$(W_{skin\ FS/RS})_{lwr}$, lower cover skin overhang material weight at the front and rear spars for current panel, lb/panel.
187	$(\Delta W_{skin\ chordwise})_{upr}$, upper cover skin increment for chordwise splice and pads at the current analysis station, calculated by BHDJT, lb/side.
188	$(\Delta W_{skin\ chordwise})_{lwr}$, lower cover skin increment for chordwise splice and pads at the current analysis station, calculated by BHDJT, lb/side.
189	$(W_{att})_{chordwise}$, cover splice and bulkhead attachment weight increment at the current analysis station, calculated by BHDJT, lb/side.
190	W_{blhd}, bulkhead weight at the current analysis station, calculated by BHDJT, lb/side.
191	W_{rib}, weight of intermediate rib replaced by bulkhead rib, multirib designs only, 0.0 for multispar or fulldepth honeycomb sandwich designs, calculated by BHDJT, lb/side.
192	K_{blhd}, weight coefficient for bulkhead weight calculation, BHDJT.
193	$(A_{skin\ FS/RS})_{upr\ sta\ i}$, cross-sectional area of upper cover skin overhang material at front and rear spars for current analysis station, calculated by BHDJT, sq in.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
194	$(A_{skin\ FS/RS})_{lwr\ sta\ i}$, cross-sectional area of lower cover skin overhang material as front and rear spars for current analysis station, calculated by BHDJT, sq in.
195	$(\Delta W_{skin})_{upr}$, upper cover skin weight increment, storage location for detail calculations by BHDJT, used to create value in location 187, lb/side.
196	$(\Delta W_{skin})_{lwr}$, lower cover skin weight increment, storage location for detail calculations by BHDJT, used to create value in location 188, lb/side.
197	W_{att}, attachment weight, storage location for detail calculations by BHDJT, used to create value in location 189, lb/side.
198	$(A_{skin\ FS/RS})_{upr\ sta\ i-1}$, upper cover skin overhang area for previous station, set up by WTCAL from value in location 193, sq in.
199	$(A_{skin\ FS/RS})_{lwr\ sta\ i-1}$, lower cover skin overhang area for previous station, set up by WTCAL from value in location 194, sq in.
200	K_{blhd}, bulkhead calculation code word and weight coefficient for current analysis station, variable CBLHD, set up by CNSTR and ACNSTR from D(650) - D(660), input data array DBLHD.
201	K_{joint}, chordwise splice calculation code word and joint width factor for current analysis station, variable CJØNT, set up by CNSTR and ACNSTR from D(661) - (671), input data array DJØNT.
Locations 202 through 214 are used by BHDJT for cover splice calculations.	
202	0.0, not used for weight calculations.
203	d_b, fastener diameter for cover splice joint, in.
204	t_s, skin thickness required for splice joint, in.
205	$(t_s)_{upr}$, upper cover skin thickness at splice joint, in.
206	$(t_s)_{lwr}$, lower cover skin thickness as splice joint, in.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
207	$0.5\ (W_{skin})_{upr}$, one-half of upper skin weight at the splice, used for weight allocation to skin splice plate or bulkhead cap, lb/side
208	$0.5\ (W_{skin})_{lwr}$, same as location 207, except for lower cover, lb/side.
209	$(\Delta W_{cap})_{blhd}$, splice weight increases for bulkhead, if single shear twice the sum of weights in locations 207 and 208, added to bulkhead weights in location 190, lb/side.
210	$(\Delta W_{skin})_{upr}$, upper cover skin increases for splice plate if double shear design, 0.0 if single shear, added to upper cover skin incremens in location 195, lb/side.
211	$(\Delta W_{skin})_{lwr}$, same as location 210, except for lower cover, lb/side.
212	Not used.
213	Not used.
214	Not used.
Locations 215 through 226 contain chordwise splice and bulkhead data sets for the inboard and outboard control stations of the current panel. These data sets are created and used by WTCAL from the BHDJT calculated data in locations 187 through 191.	
215	$(\Sigma\Delta W_{chordwise})$ IBD
216	(W_{blhd}) IBD
217	(ΔW_{skin}) upr IBD
218	(ΔW_{skin}) lwr IBD
219	(ΔW_{att}) IBD
220	(ΔW_{rib}) IBD
221	$(\Sigma\Delta W_{chordwise})$ ØBD
222	(W_{blhd}) ØBD
223	(ΔW_{skin}) upr ØBD
224	(ΔW_{skin}) lwr ØBD
225	$(\ W_{att})$ ØBD
226	(ΔW_{rib}) ØBD

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Locations 227 through 250 contain cross-sectional areas for torque-box structural elements for the previous analysis station created by WTCAL from the similar data set in locations 121 through 144. (Refer to locations 73 through 96 for definitions.) Areas are in terms of square inches of material for the structural chord.

Array Location	Description
227	(A_{skin}) upr sta i-1
228	(A_{skin}) lwr sta i-1
229	(A_{rib}) sta i-1
230	(A_{str}) upr sta i-1
231	(A_{str}) lwr sta i-1
232	$(A_{misc\ skin})$ upr sta i-1
233	$(A_{misc\ skin})$ lwr sta i-1
234	(A_{att}) sta i-1
235	(A_{misc}) rib sta i-1
236	(ΔA_{skin}) upr VF sta i-1
237	(ΔA_{skin}) lwr VF sta i-1
238	(ΔA_{str}) upr VF sta i-1
239	(ΔA_{str}) lwr VF sta i-1
240	(A_{web}) FS sta i-1
241	(A_{web}) RS sta i-1
242	(A_{cap}) FS sta i-1
243	(A_{cap}) RS sta i-1
244	(ΔA_{web}) FS VF sta i-1
245	(ΔA_{web}) RS VF sta i-1
246	(ΔA_{rib}) VF sta i-1
247	$(\Delta A_{misc\ skin})$ upr VF sta i-1
248	$(\Delta A_{misc\ skin})$ lwr VF sta i-1
249	(ΔA_{att}) VF sta i-1
250	(ΔA_{misc}) rib VF sta i-1

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Locations 251 through 274 contain weight coefficients for torque-box structural elements. This data set is created by CNSTC from D(604 - D(627), input data array DLTB(5) - DLTB(28) as array DEL variables. Each coefficient is also referenced by variable name as defined in the following.
Locations 275 through 281 are used for storage of data items in locations 66 through 72.

Array Location	Description
251	$(\delta_{cov})_{upr}$, variable DLCVU, upper cover coefficient.
252	$(\delta_{skin})_{upr}$, variable DLSKU, upper cover skin coefficient.
253	$(\delta_{str})_{upr}$, variable DLSTU, upper cover stringer or cap coefficient
254	$(\delta_{cov})_{lwr}$, variable DLCVL, lower cover coefficient.
255	$(\delta_{skin})_{lwr}$, variable DLSKL, lower cover skin coefficient.
256	$(\delta_{str})_{lwr}$, variable DLSTL, lower cover stringer or cap coefficient.
257	$(\delta_{misc\ skin})_{upr/lwr}$, variable DLSKM, miscellaneous skin coefficient
258	$(\delta_{misc\ att})_{TB}$, variable DLATT, torque-box attachment coefficient.
259	δ_{rib}, variable DLIRB, intermediate rib or spar coefficient.
260	$(\delta_{web})_{rib}$, variable DLIRW, intermediate rib or spar web coefficient.
261	$(\delta_{misc})_{rib}$, variable DLIRM, miscellaneous structure and attachment coefficient for intermediate rib or spar.
262	$(\delta_{misc})_{blhd}$, variable DBLAT, bulkhead attachment coefficient.
263	δ_{FS}, variable DELFS, front spar coefficient.
264	$(\delta_{cap})_{FS}$, variable DLFSC, front spar cap coefficient.
265	$(\delta_{web})_{FS}$, variable DLFSW, front spar web coefficient.
266	$(\delta_{misc})_{FS}$, variable DLFSM, miscellaneous structure and attachment coefficient for front spar.
267	δ_{RS}, variable DELRS, rear spar coefficient.
268	$(\delta_{cap})_{RS}$, variable DLRSC, rear spar cap coefficient.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Discription
269	$(\delta_{web})_{RS}$, variable DLRSW, rear spar web coefficient.
270	$(\delta_{misc})_{RS}$, variable DLRSM, miscellaneous structural attachment coefficient for rear spar.
271	δ_{RR}, variable DELRR, root rib coefficient.
272	$(\delta_{cap})_{RR}$, variable DLRRC, root rib cap coefficient.
273	$(\delta_{web})_{RR}$, variable DLRRW, root rib web coefficient.
274	$(\delta_{misc})_{RR}$, variable DLRRM, miscellaneous structure and attachment coefficient for root rib.
275-281	Save locations for data in locations 66 through 72.

Locations 282 through 300 are used for storage of section stiffness data by subroutine EIGJC, overlay (10,0). This set is always created after completion of strength-only analysis of metallic designs. If subsequent requirements for flutter design exists for the current analysis stations, EIGJC is executed again, resulting in loss of the strength-only data set. Thus, since section analysis data are printed after the flutter analysis pass, this set is always saved in CD(1855) - CD(1872), as previously discused.

Array Location	Discription
282	A', effective cross-sectional area of torque-box for GJ calculation.
283	$[(ds/t_{skin})_{upr} + (K_G)_{lwr} \cdot (ds/t_{skin})_{lwr}]$, sum of cover web ds/t terms, lower cover term corrected for lower cover term corrected for lower cover shear modulus effect.
284	$[(K_G)_{FS} \cdot (ds/t_{web})_{FS} + (K_G)_{RS} \cdot (ds/t_{web})_{BS}]$, sum of spar web ds/t terms, front and rear spar terms corrected for shear modulus effects.
285	$\Sigma ds/t$, sum of ds/t terms.
286	J_{sect}, $4(A')^2/\Sigma ds/t$, in.^{4}

TABLE 230. TWT ARRAY LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
287	$\bar{Y}_{sect}$, neutral axis of section, distance from upper mold line of section, in.
288	$(\bar{Y}_{cov})_{lwr}$, centroid of lower cover, distance from lower mold line of section, in.
289	$(\Sigma M)_{area}$, total moment of cover and caps about the upper mold line of section, $in.^3$
290	$(\Sigma I_x)_{cov}$, sum of upper and lower cover area moments of inertia about the neutral axis, and initially $(\Sigma I_o)_{cov}$, sum of upper and lower cover area moments of inertia about their respective centroids, lower cover term corrected for elastic modulus effects, $in.^4$
291	$(I_x)_{FS}$, area moment of enertia of front spar caps about the neutral axis, $in.^4$ Initially used for upper cover transfer term calculations: $\Delta\bar{Y}_{upr}$ distance between the upper cover centroid and the section neutral axis, in., and $A_{upr} \cdot (\Delta\bar{Y}_{upr})^2$, transfer term for upper cover inertia, $in.^4$
292	$(\Sigma I_x)_{sect}$, section area moment of inertia about the neutral axis, $in.^4$ Initially used for lower cover transfer term calculations: $\Delta\bar{Y}_{lwr}$, distance between the lower cover centroid and the section neutral axis, in., and $A_{lwr} \cdot (K_E)_{lwr} \cdot (\Delta\bar{Y}_{lwr})^2$, transfer term for lower cover inertia, $in.^4$ Also used in inertia calculations for rear spar caps, $(I_x)_{RS}$, $in.^4$
293	ΣA_{upr}, upper cover area, sq $in.^2$
294	ΣA_{lwr}, lower cover area, sq $in.^2$
295	$(\Sigma A_{cap})_{FS}$, front spar cap area, $in.^2$
296	$(\Sigma A_{cap})_{RS}$, rear spar cap area, $in.^2$
297	ΣA, total area of structural material at section, $in.^2$
298	Not used.
299	Not used.
300	Not used.

TABLE 230. TWT ARRAY LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Locations 301 through 330 contain analysis control constants and variables for metallic stringer or cap synthesis created and/or used by overlay (10,0) subroutines SECTD, SFSCH, BØTC, TSCH, STRG, and STRGØ. Data in this set are initially computed by SECTD from input design constraint information for each analysis station. Subroutines TSCH and STRGØ revise current station data as required during the evaluation of synthesis search points specified by subroutine SFSCH as b_s, $(f_c)_i$. These adjustments are made if control values for stringer geometry synthesis by subroutine STRG are affected by crippling criteria relative to plate buckling or by limiting values of stringer gage to skin gage ratios.

Array Location	Description
301	$(L_{str})_{tmg}$, developed length of current stringer based on minimum stringer gage, calculated by STRG, in.
302	$2.0\ (f_u)_{min}$, minimum length for two flanges, calculated by SECTD for riveted Z-stringer analysis by STRG, in.
303	$h_{min} + n_f f_{max}$, developed length of stringer for minimum height and maximum flange width configuration, calculated by SECTD for integral or riveted Z-stringer analysis by STRG, in.
304	$(A_{max})_{tmg}$, maximum stringer area for minimum gage configuration, initially calculated by SECTD, subsequently adjusted and reset by TSCH and STRG, sq in.
305	$(L_{str})_{min}$, minimum developed length of stringer, initially calculated by SECTD, revised by TSCH if (b/t) based on crippling criteria for minimum area calculations for current stress level, reset to SECTD value on TSCH return to SFSCH, in. Used also by SFSCH and BØTC for initial data calculations for new stringer spacing specified by SECTD to SFSCH.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
306	$(L_{str})_{max}$, maximum developed length of stringer, calculated by SECTD from input maximum height and flange values, in.
307	$(b/t)_{max}$, control point for integral or riveted Z-stringer synthesis by STRG, current design allowable b/t values less than this value are checked for local stability, larger values direct STRG to size stringer to satisfy physical geometry relationships. SECTD initially computes this value as the larger of h_{max}/t_{mg} or f_{max}/t_{mg}. If the control value is based on h_{max}, stringer analysis code word IMX, ND(71), is set to 1, and to 2 if based on f_{max}. Subroutine TSCH recomputes these values if crippling criteria dictates local stability requirements or if stringer minimum gage increase is necessary due to minimum stringer gage to skin gage ratio requirements.
308	h_{min}/t_{mg}, minimum stringer web b/t for minimum size configuration, initially calculated by SECTD, revised by TSCH for changes in minimum stringer gage.
309	h_{max}/t_{mg}, maximum stringer web b/t for maximum size minimum gage stringer, similar to location 308.
310	f_{max}/t_{mg}, similar to location 309, except for maximum flange width. Value initially calculated by SECTD, revised by TSCH if b/t based on crippling criteria.
311	f_{min}/t_{mg}, similar to location 310, except for minimum flange width.
312	$(b/t)_{f\ reqd}$, minimum b/t for flange design, calculated by TSCH from allowable plate buckling or crippling b/t for current stress level.
313	$(A_{str})_{min\ i}$, maximum stringer area for current stress level point, calculated by STRGØ as the larger of stringer area based on minimum specified size or minimum size dictated by minimum gage and associated web height and/or flange widths required for local stability, sq in.
314	$(h_{str})_{min\ i}$, minimum stringer height for current stress level point, calculated by STRGØ is the larger of input h_{min} or minimum web height indicated by local stability and minimum gage, in.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Locations	Description
315	$(f_{upr})_{min\ i}$, minimum width of riveting flange for riveted Z-stringer analysis only, calculated by STRGØ, similar to location 314, 0.0 for integral I- or Z-stringers, in.
316	$(f_{lwr})_{min\ i}$, minimum width of outstanding flange for integral Z- or riveted Z-stringer analysis, similar to locations 314 and 315, 0.0 for integral I-stringers, in.
317	$(A_{max})_{(b/t)\ i}$, maximum stringer area based on stringer gage dictated by local stability b/t at maximum stringer height or flange widths, calculated by STRGØ for current stress level point, sq in.
318	Not used.
319	Storage location for intermediate calculation data, STRG and STRGØ.
320	Storage location for intermediate calculation data, STRG and STRGØ
Locations 321, 322, 323 and 324 are used by STRG for temporary storage of stringer analysis control data computed and used during initial STRG calculations for minimum stringer gage adjustments and during data reset operations at the conclusion of STRG analysis for stringer design.	
321	$(t_{str})_{min\ i}$, stringer gage computed as a function of skin gage based on factor specified in D(455), input variable STRSK, assumed to be minimum stringer gage if larger than input value, variable STRMN, D(371), when skin gage is critical for local stability b/t. If the skin is not b/t critical, the initial value is reduced by the square root of the ratio of required skin b/t to available skin b/t, with the lower limit for the resulting gage limited by the factor specified in D(456), variable STRRØ.
322	$(t_{str})_{min\ o}$, temporary storage location for input minimum stringer gage, variable STRMN, D(271). Used for initial scaling operation and exit reset operations.
323	R_{tstr}, ratio of calculated minimum stringer gage to input minimum gage for initial scaling operations, reciprocal of this value for exit reset operations.
324	$(t_{str})_{cal\ min}$, calculated value of stringer minimum gage based on skin criteria as discussed previously for location 321, in.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Locations	Description
Locations 325, 326, and 327 are used for TSCH calculations similar to those for STRG discussed previously for locations 321, 322, 323, and 324, except that TSCH operations are made for the skin gage value critical for local stability b/t, TSS(57).	
325	$(t_{str})_{min\ o}$, same as location 322, in.
326	$(t_{str})_{cal\ min}$, same as location 324, in.
327	R_{tstr}, same as location 323.
328	Not used.
329	Not used.
330	Not used.
The following descriptions are for TWT array locations 57 through 96 as used by subroutine VFCAL during evaluation of torque-box web requirements for flutter stiffness criteria. Refer to general discussion text of this table for additional information. This data set is described here for clarity.	
57	$(K_G)_{upr}(ds)_{upr}$, web length for upper skin corrected for effective shear modulus of web, in. Initially $(K_G)_{upr}$, upper skin effective shear modulus factor = 1.0.
58	$(K_G)_{lwr}(ds)_{lwr}$, web length for lower skin corrected for effective shear modulus of lower cover, in. Initially $(K_G)_{lwr}$ from location 176.
59	$(K_G)_{FS}(ds)_{FS}$, web length for front spar web corrected for effective shear modulus of front spar, in. Initially $(K_G)_{FS}$ from location 177.
60	$(K_G)_{RS}(ds)_{RS}$, web length for rear spar web corrected for effective shear modulus of rear spar, in. Initially $(K_G)_{RS}$ from location 178.
61	$(K_G)_{upr}(ds)_{upr}/(t_{skin})_{upr}$, effective ds/t for strength design upper skin. Initially $(ds)_{upr}$, in.
62	$(K_G)_{lwr}(ds)_{lwr}/(t_{skin})_{lwr}$, effective ds/t for strength design lower skin. Initially $(ds)_{lwr}$, in.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Locations	Description
63	$(K_G)_{FS}(ds)_{FS}/(t_{web})_{FS}$, effective ds/t for strength design front spar web. Initially $(ds)_{FS}$, in.
64	$(K_G)_{RS}(ds)_{RS}/(t_{web})_{RS}$, effective ds/t for strength design rear spar web. Initially $(ds)_{RS}$, in.
65	$(\Delta t_{skin})_{upr\ VF}$, upper skin gage increment for flutter design, in.
66	$(\Delta t_{skin})_{lwr\ VF}$, lower skin gage increment for flutter design, in.
67	$(\Delta t_{web})_{FS\ VF}$, front spar web gage increment for flutter design in.
68	$(\Delta t_{web})_{RS\ VF}$, rear spar web gage increment for flutter design, in.

Locations 69 through 76 and 79 through 94 contain 4-cell data sets of stepwise stiffness increase parameters for the 4-web system in which the webs are arranged in the order of strength-design gage values, starting with the thinnest web as the first element, through the thickest as the fourth element. Integer variables N1, N2, N3, and N4 (ND(41), ND(42), ND(43), and ND(44)) contain the code value for the torque-box web assigned to the ordered set, 1 for upper skin, 2 for lower skin, 3 for front spar web, and 4 for rear spar web. Locations 77 and 78 contain data for the current web from the ordered set. VFCAL uses integer variable J, ND(30), for the ordered set and analysis step index, and integer variable N, ND(31), for the torque-box web index.

69	$\Sigma\Delta t_1$, web gage increase for web 1, sum of thickness increment for steps 1, 2, 3, and 4, in.
70	$\Sigma\Delta t_2$, web gage increase for web 2, sum of thickness increments for for steps 2, 3, and 4, in.
71	$\Sigma\Delta t_3$, web gage increase for web 3, sum of thickness increments for steps 3 and 4, in.
72	$\Sigma\Delta t_4$, web gage increase for web 4, sum of thickness increment for step 4, in.
73	Δt_1, web gage increase for step 1, web gage difference between webs 2 and 1, or less if ds_1 and Δt_1 results in required stiffness, in.
74	Δt_2, web gage increase for step 2, web gage difference between webs 3 and 2, or less if $ds_2 + ds_1$ and Δt_2 results in required stiffness after accounting for Δt_1 effects, in.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONT)

Array Location	Description
75	Δt_3, web gage increase for step 3, web gage difference between webs 4 and 3, or less if $ds_3 + ds_2 + ds_1$ and Δt_3 results in required stiffness after accounting for Δt_1 and Δt_2 effects, in.
76	Δt_4, web gage increase for step 4, web gage increase required using $ds_4 + ds_3 + ds_2 + ds_1$ to satisfy requirement after accounting for effects of Δt_1, Δt_2, and Δt_3, in.
77	$(t_o)_{i+1}$, web gage for step i + 1, used in steps 1, 2, and 3, in.
78	$(d_s)_i/(t_o)_{i+1}$, ds/t value for current web element using $(t_o)_{i+1}$.
79	$[K_G ds/(t_o)]_1$, ds/t term for first web element of ordered set.
80	$[K_G ds/(t_o)]_2$, ds/t term for second web element of ordered set.
81	$[K_G ds/(t_o)]_3$, ds/t term for third web element of ordered set.
82	$[K_G ds/(t_o)]_4$, ds/t term for fourth web element of ordered set.
83	$(K_G ds)_1$, ds value for first web element of ordered set, in.
84	$(K_G ds)_2$, ds value for second web element of ordered set, in.
85	$(K_G ds)_3$, ds value for third web element of ordered set, in.
86	$(K_G ds)_4$, ds value for fourth web element of ordered set, in.
87	$(t_o)_1$, first web thickness of ordered set, in.
88	$(t_o)_2$, second web thickness of ordered set, in.
89	$(t_o)_3$, third web thickness of ordered set, in.
90	$(t_o)_4$, fourth web thickness of ordered set, in.
91	$(K_G ds)_1'$, web length for first step calculations, in.
92	$(K_G ds)_2'$, web length for second step calculations, sum of first and second ds of ordered set, in.
93	$(K_G ds)_3'$, web length for third step calculations, sum of first, second, and third ds of ordered set, in.
94	$(K_G ds)_4'$, web length for fourth step calculations, sum of first, second, third, and fourth ds of ordered set, in.

TABLE 230. TWT ARRAY, LOCATIONS 1 THROUGH 330, WEIGHT ANALYSIS DATA AND CONSTANTS (CONCL)

Array Location	Description
95	$(\Sigma ds/t)_{reqd}$, ds/t required for flutter stiffness, $(4A^2/J_{VF})$. Initially ΔJ, difference between required and available J, $in.^4$
96	$(\Sigma ds/t)_{avail}$, current step ds/t value, initially available ds/t for strength design, $(4A^2/J_{st})$.

TABLE 231. TWT ARRAY, LOCATIONS 331-400, SECTION WEIGHT PER INCH DATA, SUBROUTINE WTPIN

General information for array TWT:

Blank common reference location = CD(1101)

Array size = 400 cells

Locations 331 through 400 of array TWT are used for storage and retrieval of section weight per inch data calculated by subroutine WTPIN at each analysis station, for metallic structures in overlay (10,0) and advanced composite structures in overlay (18,0). Computed data for each station are saved by WTPIN in array TW, locations 1 through 550, arranged in 11 50-cell data sets - set 1 in locations 1 through 50 for the tip station, and locations 501 through 550 for the root station. Each set consists of station data from TWT(331) - TWT(380). These 11-station data sets are used by subroutine CSECW for weight analysis of center-section structures and by subroutine DLPVT for weight estimation of fixed torque-box structures deleted and replaced with pivot structures of variable-sweep wing designs. Locations 331 through 400 are set to 0.0 values by WTPIN before current station analysis is made. Subroutine PRTC prints the contents of locations 331 through 393 under control of internal print control word IPB for each station analyzed.

Array Location	Description
1-330	Defined in Table 330. Station weight data computed by subroutines WTCAL and BHDJT and stored in locations 121-144, 186-190, 193, and 194 are used by WTPIN. Torque-box weight coefficients used by WTPIN as array DEL variables are stored in locations 251 through 280. The coefficient values of array DEL are created by subroutine CNSTC.
Locations 331 through 354 contain weight-per-inch values computed from the cross-sectional areas stored in TWT(121) - TWT(144). Values for data items in locations 333, 339, 344 through 347, 353, and 354 are subsequently changed by WTPIN.	
331	$(w_{skin})_{upr}$, upper cover skin weight, lb/in.
332	$(w_{skin})_{lwr}$, lower cover skin weight, lb/in.
333	(w_{rib}), intermediate rib or spar weight, $\delta_{rib} \cdot \delta_{rib\ web} \cdot A_{rib} \cdot \rho$, lb/in.
334	$(w_{str})_{upr}$, upper cover stringer or cap weight, lb/in.
335	$(w_{str})_{lwr}$, lower cover stringer or cap weight, lb/in.

TABLE 231. TWT ARRAY, LOCATIONS 331-400, SECTION WEIGHT PER INCH DATA, SUBROUTINE WTPIN (CONT)

Array Location	Description
336	$(w_{misc\ skin})_{upr}$, upper cover miscellaneous skin weight, lb/in.
337	$(w_{misc\ skin})_{lwr}$, lower cover miscellaneous skin weight, lb/in.
338	w_{att}, cover-to-support structure attachment weight, lb/in.
339	$(\Delta w_{att})_{VF}$, miscellaneous attachment weight increment for flutter design, initially $(w_{misc})_{rib}$, lb/in.
340	$(\Delta w_{skin})_{upr\ VF}$, upper cover skin weight increment for flutter design, lb/in.
341	$(\Delta w_{skin})_{lwr\ VF}$, lower cover skin weight increment for flutter design, lb/in.
342	$(\Delta w_{str})_{upr\ VF}$, upper cover stringer or cap weight increment for flutter design, lb/in.
343	$(\Delta w_{str})_{lwr\ VF}$, lower cover stringer or cap weight increment for flutter design, lb/in.
344	$(w_{web})_{FS}$, front spar web weight, initially Σw_{FS}, lb/in.
345	$(w_{web})_{RS}$, rear spar web weight, initially Σw_{RS}, lb/in.
346	$(w_{cap})_{FS}$, front spar cap weight, lb/in.
347	$(w_{cap})_{RS}$, rear spar cap weight, lb/in.
348	$(\Delta w_{web})_{FS\ VF}$, front spar web weight increment for flutter design, lb/in.
349	$(\Delta w_{web})_{RS\ VF}$, rear spar web weight increment for flutter design, lb/in.
350	$(\Delta w_{rib})_{VF}$, intermediate rib or spar weight increment for flutter design, lb/in.
351	$(\Delta w_{misc\ skin})_{upr\ VF}$, upper cover miscellaneous skin weight increment for flutter design, lb/in.
352	$(\Delta w_{misc\ skin})_{lwr\ VF}$, lower cover miscellaneous skin weight increment for flutter design, lb/in.

TABLE 231. TWT ARRAY, LOCATIONS 331-400, SECTION WEIGHT PER INCH DATA, SUBROUTINE WTPIN (CONT)

Array Location	Description
353	$(w_{skin\ FS/RS})_{upr}$, weight of upper cover skin overhang material at front and rear spar, initially $(\Delta w_{att})_{str\ VF}$, stringer-to-skin attachment weight increment for flutter design, lb/in.
354	$(w_{skin\ FS/RS})_{lwr}$, weight of lower cover skin overhang material at front and rear spar, initially $(\Delta w_{misc})_{rib\ VF}$, miscellaneous rib or spar structure weight increment for flutter design, lb/in.
355	$(w_{misc})_{FS}$, weight of miscellaneous structure and attachment items for front spar, lb/in.
356	$(w_{misc})_{RS}$, weight of miscellaneous structure and attachment items for rear spar, lb/in.
357	$(w_{misc})_{rib}$, miscellaneous rib or spar structure weight, lb/in.
358	$(\Sigma w_{cov})_{upr}$, total upper cover weight, strength and flutter design, lb/in.
359	$(\Sigma w_{cov})_{upr}$, total lower cover weight, strength and flutter design, lb/in.
360	Σw_{rib}, total intermediate rib or spar weight, strength and flutter design, lb/in.
361	Σw_{FS}, total front spar up and web weight, strength and flutter design, lb/in.
362	Σw_{RS}, total rear spar cap and web weight, strength and flutter design, lb/in.
363	W_{rib}, weight of one rib at the current analysis control station, multirib designs only, 0.0 for multispar and fulldepth honeycomb sandwich designs, lb/side.
364	W_{RR}, root rib weight, root station only, lb/side.
365	$(W_{cap})_{RR}$, root rib cap weight, root station only, lb/side.

TABLE 231. TWT ARRAY, LOCATIONS 331-400, SECTION WEIGHT PER INCH DATA, SUBROUTINE WTPIN (CONT)

Array Location	Description
366	$(W_{web})_{RR}$, root rib cap weight, root station only, lb/side.
367	$(W_{misc})_{RR}$, root rib miscellaneous and attachment weight, root station only, lb/side.
368	Not used.
369	Not used.
370	Not used.
371	Σw_{TB}, total torque-box weight, strength and flutter design, lb/in.
372	Not used.
373	Not used.
374	Σw_{misc}, total miscellaneous structure and attachment weight, strength and flutter design, lb/in.
375	$(\Delta w_{skin\ chordwise})_{upr}$, incremental weight of upper cover skin splice or pad material, distributed as a chordwise strip along the structural chord of the current analysis station, lb/side.
376	$(\Delta w_{skin\ chordwise})_{lwr}$, incremental weight of lower cover skin splice or pad material, distributed as a chordwise strip along the structural chord of the current analysis station, lb/side.
377	$(\Delta w_{att})_{chordwise}$, attachment weight for chordwise splice or bulkhead, distributed as a chordwise strip along the structural chord of the current analysis station, lb/side.
378	w_{blhd}, weight of bulkhead, distributed as a chordwise strip along the structural chord of the current analysis station, lb/side.
379	W_{rib}, weight of one intermediate rib at the current analysis station, rib to be locally replaced with bulkhead, computed for multirib designs only, 0.0 for multispar or fulldepth honeycomb sandwich designs, lb/side.

TABLE 231. TWT ARRAY, LOCATIONS 331-400, SECTION WEIGHT PER INCH DATA, SUBROUTINE WTPIN (CONT)

Array Location	Description
380	$\Sigma\Delta w_{VF}$, total torque-box weight increment for flutter design, lb/in.
381	Σw_{PNL}, total surface weight, lb/in.
382	Σw_{TB}, total torque-box weight, lb/in.
383	Σw_{LE}, total leading edge weight, lb/in.
384	Σw_{TE}, total trailing edge weight, lb/in.
385	Σw_{MISC}, total surface secondary structure weight, lb/in.
386	$\Sigma\Delta w_{VF}$, total weight increment for flutter design, lb/in.
387	$(\Sigma\Delta W_{TB})_{chordwise}$, total weight of local chordwise structures of torque-box, computed by subroutine WTCAL as additional weights to be combined with spanwise structures, lb/side. These items are assumed to be uniformly distributed along the structural chord of the current analysis station for mass distribution analysis.
388	$(\Sigma\Delta W_{TB})_{chordwise\ \emptyset B}$, total weight of local chordwise structures at the outboard station of the current torque-box panel, computed by WTCAL as one-half of the calculated weights of these structures for the previous analysis station, if any, lb/side.
389	$(\Sigma\Delta W_{TB})_{chordwise\ IB}$, total weight of local chordwise structures at the inboard station of the current torque-box panel, computed by WTCAL as one-half of the calculated weights of these structures for the current analysis station, if any, lb/side. Total calculated weight used for the root panel.

TABLE 231. TWT ARRAY, LOCATIONS 331-400, SECTION WEIGHT PER INCH DATA, SUBROUTINE WTPIN (CONCL)

Array Location	Description
390	$(\Sigma\Delta W_{TB})_{CDL}$, total weight of torque-box structural provisions and fittings for concentrated mass attachment to the current torque-box panel, set up by WTCAL from structure weight increments computer by subroutine CDL, overlay (15,0), and currently stored in subarray DPCDL (reference location T(220) - T(229)), lb/side.
391	$(\Sigma\Delta W_{TB})_{conc}$, total weight of torque-box structures for the current panel, consisting of items not represented by Σw_{TB} in location 382. Computed by WTCAL as the total weight of the items stored in location TWT(106) - TWT(109), plus TWT(146) if tip panel, or TWT(56) if root panel (Table 230), lb/side.
392-398	Not used.
399	$(\delta_{cov})_{upr}$ or $(\delta_{cov})_{lwr}$, temporary storage location for upper or lower cover weight coefficient, used by WTPIN for total cover weight per inch calculations. Initially $(t_w)_{FS}$ or $(t_w)_{RS}$, front and rear spar web gage, used by WTPIN for front spar weight per inch calculations, in.
400	$(w_{web})_{FS}/K_{misc\ FS}$ or $(w_{web})_{RS}/K_{misc\ RS}$, temporary storage for front and rear spar calculations by WTPIN, lb/in.

TABLE 232. TWT ARRAY, LOCATIONS 331-400, CENTER-SECTION WEIGHT DATA, SUBROUTINE CSECW

General information for array TWT:

Blank common reference location = CD(1101)

Array size = 400 cells

Locations 331 through 400 of array TWT are used for storage and retrieval of center-section weight per inch data calculated by subroutine CSECW, and used to estimate center-section structure weights for metallic designs in overlay (9,0) and advanced composite designs in overlay (18,0). Computed data are based on outer panel root station design reflected in the station 1 weight-per-inch data set stored as a 50-cell block in TW(501) - TW(550) by subroutine WTPIN (Table 231). Center-section weight-per-inch at the side of body, $Y = b_1/2$, and vehicle centerline, $Y = 0.0$, are computed by CSECW and stored as identical sets in locations 331 plus 333 through 354, and 332 plus 357 through 378. These items, plus additional centerline rib data in locations 355, 356, 379, and 380, are saved as a 50-cell data set in array TW, locations 551 through 600, for use by subroutine DLPVT in the weight estimation of fixed torque-box structures deleted and replaced with pivot structures of variable-sweep wing designs. Calculated weights for center-section structures are stored in array TSS, locations 1 through 50 (Table 236). TWT (380), TSS(1) - TSS(50), and TW(550) - TW(600) are all set to 0.0 values by CSECW before logic check for center-section weight analysis. Subroutines TBØPT, overlay (9,0), and ATBØPT, overlay (18,0), use subroutine PRTH to print the contents of TWT(331) - TWT(393) plus TSS(1) - TSS(54) under control of internal print control word IPA (logic tests made only if center-section weights are calculated).

Array Location	Description
331	$(\Sigma w_{CSEC})_{b_1/2}$, center-section weight at side-of-body, lb/in.
332	$(\Sigma w_{CSEC})_{C/L}$, center-section weight at centerline, lb/in.

Locations 333 through 354 contain weight per inch data for the center-section components at the side-of-body station, $b_1/2$. These weights are based on root station weights of corresponding outer-panel torque-box components adjusted for differences in weight coefficient values.

333	$(\Sigma w_{cov})_{upr,\ b_1/2}$, total upper cover weight at side-of-body lb/in.

TABLE 232. TWT ARRAY, LOCATIONS 331-400, CENTER-SECTION WEIGHT DATA, SUBROUTINE CSECW (CONT)

Array Location	Description
334	$(\Sigma w_{cov})_{upr\ b_1/2}$, total lower cover weight at side-of-body, lb/in.
335	$(\Sigma w_{rib})_{b_1/2}$, total intermediate rib or spar weight at side-of-body, lb/in.
336	$(\Sigma w_{FS})_{b_1/2}$, total front spar weight at side-of-body, lb/in.
337	$(\Sigma w_{RS})_{b_1/2}$, total rear spar weight as side-of-body, lb/in.
338	$(\Sigma w_{misc})_{b_1/2}$, total miscellaneous structure and attachment weight at side-of-body, lb/in.
339	$(w_{skin})_{upr\ b_1/2}$, upper cover skin weight at side-of-body, lb/in.
340	$(w_{str})_{upr\ b_1/2}$, upper cover stringer or cap weight at side-of-body, lb/in.
341	$(w_{misc\ skin})_{upr\ b_1/2}$, upper cover miscellaneous skin weight at side-of-body, lb/in.
342	$(w_{skin})_{lwr\ b_1/2}$, lower cover skin weight at side-of-body, lb/in.
343	$(w_{str})_{lwr\ b_1/2}$, lower cover stringer or cap weight at side-of-body, lb/in.
344	$(w_{misc\ skin})_{lwr\ b_1/2}$, lower cover miscellaneous skin weight at side-of-body, lb/in.
345	$(w_{cap})_{FS\ b_1/2}$, front spar cap weight at side-of-body, lb/in.
346	$(w_{cap})_{RS\ b_1/2}$, rear spar cap weight at side-of-body, lb/in.
347	$(w_{web})_{FS\ b_1/2}$, front spar web weight at side-of-body, lb/in.
348	$(w_{web})_{RS\ b_1/2}$, rear spar web weight at side-of-body, lb/in.
349	Not used.
350	Not used.
351	Not used.
352	$(\Delta w_{skin\ chord\ wise})_{upr\ b_1/2}$, incremental weight for upper cover skin material distributed as a chordwise strip at the side-of-body, provisions for chordwise skin splice or bulkhead attach skin pads, lb/side.
353	$(\Delta w_{skin\ chord\ wise})_{lwr\ b_1/2}$, incremental weight for lower cover skin material distributed as a chord wise strip at the side-of-body for skin splice or pad, lb/side.

TABLE 232. TWT ARRAY, LOCATIONS 331-400, CENTER-SECTION WEIGHT DATA, SUBROUTINE CSECW (CONT)

Array Location	Description
354	$(\Delta w_{att\ chord\ wise})_{b_1/2}$, attachment weight for skin splice or bulkhead, distributed as a chordwise strip at the side-of-body, lb/side.
355	$(W_{blhd})_{C/L}$, weight of bulkhead at centerline, lb/side.
356	$(W_{att})_{C/L\ blhd}$, weight of cover attachments for centerline bulkhead, lb/side.

Locations 357 through 378 contain weight per inch data for the center-section components at the centerline station. These weights are based on side-of-body weights stored in locations 333 through 354 adjusted for cross-section differences between the stations.

Array Location	Description
357	$(\Sigma w_{cov})_{upr\ C/L}$, total upper cover weight at centerline, lb/in.
358	$(\Sigma w_{cov})_{lwr\ C/L}$, total lower cover weight at centerline, lb/in.
359	$(\Sigma w_{rib})_{C/L}$, total intermediate rib or spar weight at centerline, lb/in.
360	$(\Sigma w_{FS})_{C/L}$, total front spar weight at centerline, lb/in.
361	$(\Sigma w_{RS})_{C/L}$, total rear spar weight at centerline, lb/in.
362	$(\Sigma w_{misc})_{C/L}$, total miscellaneous structure and attachment weight at centerline, lb/in.
363	$(w_{skin})_{upr\ C/L}$, upper cover skin weight at centerline, lb/in.
364	$(w_{str})_{upr\ C/L}$, upper cover stringer or cap weight at centerline, lb/in.
365	$(w_{misc\ skin})_{upr\ C/L}$, upper cover miscellaneous skin weight at centerline, lb/in.
366	$(w_{skin})_{lwr\ C/L}$, lower cover skin weight at centerline, lb/in.
367	$(w_{str})_{lwr\ C/L}$, lower cover stringer or cap weight at centerline, lb/in.
368	$(w_{misc\ skin})_{lwr\ C/L}$, lower cover miscellaneous skin weight at centerline, lb/in.
369	$(w_{cap})_{FS\ C/L}$, front spar cap weight at centerline, lb/in.
370	$(w_{cap})_{RS\ C/L}$, rear spar cap weight at centerline, lb/in.

TABLE 232. TWT ARRAY, LOCATIONS 331-400, CENTER-SECTION WEIGHT DATA, SUBROUTINE CSECW (CONCL)

Array Location	Description
371	$(w_{web})_{FS\ C/L}$, front spar web weight at centerline, lb/in.
372	$(w_{web})_{RS\ C/L}$, rear spar web weight at centerline, lb/in.
373	Not used.
374	Not used.
375	Not used.
376	$(\Delta w_{skin\ chord\ wise})_{upr\ C/L}$, incremental weight for upper cover skin material distributed as a chordwise strip at the centerline, provisions for chordwise skin splice or bulkhead attach skin pods, lb/side.
377	$(\Delta w_{skin\ chord\ wise})_{lwr\ C/L}$, incremental weight of lower cover skin material distributed as a chordwise strip at the centerline for skin splice or pad, lb/side.
378	$(\Delta w_{att\ chord\ wise})_{C/L}$, attachment weight for skin splice or bulkhead, distributed as a chordwise strip at the centerline, lb/side.
379	$(W_{cap})_{C/L\ blhd}$, centerline bulkhead cap weight, lb/side.
380	$(W_{web})_{C/L\ blhd}$, centerline bulkhead web weight, lb/side.
381 397	Not used.
398	$(W_{misc})_{FS}$ or $(W_{misc})_{RS}$, temporary storage for front and rear calculations, lb/in.
399	$(W_{misc})_{rib}$, temporary storage for miscellaneous weight calculations, lb/in.
400	W_{att}, temporary storage for miscellaneous weight calculations, lb/in.

TABLE 233. TWT ARRAY, LOCATIONS 1 THROUGH 50 AND 311 THROUGH 400, TORQUE-BOX WEIGHT INCREMENT DATA FOR PIVOT DESIGNS, SUBROUTINE DLPVT

General information for array TWT:

Blank common reference location = CD(1101)

Array size = 400 cells

Locations 331 through 400 of array TWT are used by subroutine DLPVT to compute weights of outer-panel torque-box and center-section structures to be replaced with pivot structures. Weights are computed from the 12 50-cell weight-per-inch data sets stored in array TW, locations 1 through 600. Incremental weight for the outer-panel torque-box are stored in array TWT, locations 1 through 50; center-section weights are stored in array TSS, locations 1 through 50. These output arrays are subsequently combined with the basic "clean wing" weight summary sets and used in overlay (17,0) for final weight calculations. Outer-panel data used by DLPVT, TW(1) - TW(550), consist of subroutine WTPIN data computed and stored in TWT(331) - TWT(380), Table 231. Center-section data, TW(551) - TW(600), are computed by subroutine CSEW, stored in TWT(331) - TWT(380), Table 232. Subroutine DLPVT initializes TWT(331) - TWT(400) to 0.0 values before calculations are made. Locations 1 through 50 of output arrays TWT and TSS are set to 0.0 values by subroutines TBØPT, overlay (9,0), for metallic designs, or subroutine ATBØPT, overlay (18,0), for advanced composite designs. These subroutines use subroutine PRTH to print the contents of arrays TSS and TWT, under control of internal print control word IPA (logic tests are made only if pivot designs are evaluated).

Array Locations	Description
	Locations 1 through 50 contain outer-panel torque-box weights to be subtracted from the basic "clean wing" weights calculated and stored in TWT(1) - TWT(50) by subroutine WTCAL (Table 230). Data in these locations are identical to those of Table 230, except that locations 39 through 50 are not used by DLPVT and contain 0.0 values. Subroutine DLPVT initially computes these items in terms of weights per side then converts them into weights per air vehicle. The weights are computed as positive values; in overlay (17,0), subroutine PRTD subtracts these values from "clean wing" totals during computations of final weights.

TABLE 233. TWT ARRAY, LOCATIONS 1 THROUGH 50 AND 311 THROUGH 400, TORQUE-BOX WEIGHT INCREMENT DATA FOR PIVOT DESIGNS, SUBROUTINE DLPVT (CONT)

1	$(\Delta\Sigma W_{TB}$, total torque-box weight, lb per A/V.
2	$(\Delta\Sigma W_{cov})_{upr}$, total lower cover weight, lb per A/V.
3	$(\Delta\Sigma W_{cov})_{lwr}$, total lower cover weight, lb per A/V.
4	$(\Delta\Sigma\Delta W_{TB})_{VF}$, total torque-box weight increment for flutter design, lb per A/V.
5	$\Delta\Sigma W_{rib}$, total intermediate rib or spar weight, lb per A/V
6	$\Delta\Sigma W_{FS}$, total front spar weight, lb per A/V.
7	$\Delta\Sigma W_{RS}$, total rear spar weight, lb per A/V.
8	$\Delta\Sigma W_{misc}$, total miscellaneous structure and attachment weight, lb per A/V.
9	$(\Delta W_{skin})_{upr}$, upper cover skin weight, lb per A/V.
10	$(\Delta W_{str})_{upr}$, upper cover stringer or cap weight, lb per A/V.
11	$(\Delta W_{misc\ skin})_{upr}$, upper cover miscellaneous skin weight, lb per A/V.
12	$(\Delta W_{skin})_{lwr}$, lower cover skin weight, lb per A/V.
13	$(\Delta W_{str})_{lwr}$, lower cover stringer or cap weight, lb per A/V.
14	$(\Delta W_{misc\ skin})_{lwr}$, lower cover miscellaneous skin weight, lb per A/V
15	$(\Delta W_{cap})_{FS}$, front spar cap weight, lb per A/V.
16	$(\Delta W_{web})_{FS}$, front spar web weight, lb per A/V.
17	$(\Delta W_{cap})_{RS}$, rear spar cap weight, lb per A/V.
18	$(\Delta W_{web})_{RS}$, rear spar web weight, lb per A/V.
19	$(\Delta W_{skin})_{upr\ VF}$, upper cover skin weight increment for flutter design, lb per A/V.
20	$(\Delta W_{str})_{upr\ VF}$, upper cover stringer or cap weight increment for flutter design, lb per A/V.
21	$(\Delta W_{misc\ skin})_{upr\ VF}$, upper cover miscelleneous skin weight increment for flutter design, lb per A/V
22	$(\Delta W_{skin})_{lwr\ VF}$, lower cover skin weight increment for flutter design, lb per A/V.
23	$(\Delta W_{str})_{lwr\ VF}$, lower cover stringer or cap weight increment for flutter design, lb per A/V

TABLE 233. TWT ARRAY, LOCATIONS 1 THROUGH 50 AND 311 THROUGH 400, TORQUE-BOX WEIGHT INCREMENT DATA FOR PIVOT DESIGNS, SUBROUTINE DLPVT (CONT)

Array Location	Description
24	$(\Delta W_{misc\ skin})_{lwr\ VF}$, lower cover miscellaneous skin weight increment for flutter design, lb per A/V.
25	$(\Delta W_{rib})_{VF}$, intermediate rib or spar weight increment for flutter design, lb per A/V.
26	$(\Delta W_{web})_{FS\ VF}$, front spar web weight increment for flutter design, lb per A/V.
27	$(\Delta W_{web})_{RS\ VF}$, rear spar web weight increment for flutter design, lb per A/V.
28	$(\Delta W_{att})_{VF}$, miscellaneous structure and attachment weight increment for flutter design, lb per A/V.
29	0.0, not used.
30	ΔW_{blhd}, bulkhead weight, lb per A/V.
31	ΔW_{RR}, root rib weight, from location 35, lb per A/V.
32	$(\Delta W_{cap})_{RR}$, root rib cap weight, from location 36, lb per A/V.
33	$(\Delta W_{web})_{RR}$, root rib web weight, from location 37, lb per A/V.
34	$(\Delta W_{misc})_{RR}$, root rib miscellaneous and attachment weight, from location 38, lb per A/V.
35	ΔW_{RR}, root rib weight, lb per A/V.
36	$(\Delta W_{cap})_{RR}$, root rib cap weight, lb per A/V.
37	$(\Delta W_{web})_{RR}$, root rib web weight, lb per A/V.
38	$(\Delta W_{misc})_{RR}$, root rib miscellaneous and attachment weight, lb per A/V.
39-50	0.0, not used.
Locations 51 through 330 are not used for DLPVT calculations. (Refer to Table 230.)	
51-330	Not used.

TABLE 233. TWT ARRAY, LOCATIONS 1 THROUGH 50 AND 311 THROUGH 400, TORQUE-BOX WEIGHT INCREMENT DATA FOR PIVOT DESIGNS, SUBROUTINE DLPVT (CONT)

Array Location	Description
Locations 331 through 366 contain outer-panel torque-box weights computed from the weight-per-inch data stored in TW(1) through TW(550). These weights include the torque-box structures between the inboard and outboard lug-rib stations determined by subroutine PIVØT. These locations are used by subroutine DLPVT to sum the weights of affected torque-box panel weights based on the structural reference line stations for the 11 outer panel analysis stations and the lug-rib stations. Subroutine DLPVT logic is programmed to start the accumulation of weights at the outermost full or partial panel first, proceeding inboard until the root panel or the panel which contains the inboard lug-rib has been evaluated. If the inboard lug-rib is within the center-section, outer-panel integration is stopped and additional computations made for estimation of center-section weights to be deleted.	
331	$(W_{skin})_{upr}$, upper cover skin weight, lb/side.
332	$(W_{skin})_{lwr}$, lower cover skin weight, lb/side.
333	$(W_{rib}$, intermediate rib or spar weight, lb/side.
334	$(W_{str})_{upr}$, upper cover stringer or cap weight, lb/side.
335	$(W_{str})_{lwr}$, lower cover stringer or cap weight, lb/side.
336	$(W_{misc\ skin})_{upr}$, upper cover miscellaneous skin weight, lb/side.
337	$(W_{misc\ skin})_{lwr}$, lower cover miscellaneous skin weight, lb/side.
338	W_{att}, cover attachment weight, lb/side.
339	$(\Delta W_{att})_{VF}$, miscellaneous attachment weight increment for flutter design, lb/side.
340	$(\Delta W_{skin})_{upr\ VF}$, upper cover skin weight increment for flutter design, lb/side.
341	$(\Delta W_{skin})_{lwr\ VF}$, lower cover skin weight increment for flutter design, lb/side.
342	$(\Delta W_{str})_{upr\ VF}$, upper cover stringer or cap weight increment for flutter design, lb/side.
343	$(\Delta W_{str})_{lwr\ VF}$, lower cover stringer or cap weight increment for flutter design, lb/side.

TABLE 233. TWT ARRAY, LOCATIONS 1 THROUGH 50 AND 311 THROUGH 400, TORQUE-BOX WEIGHT INCREMENT DATA FOR PIVOT DESIGNS, SUBROUTINE DLPVT (CONT)

Array Location	Description
344	$(W_{web})_{FS}$, front spar web weight, lb/side.
345	$(W_{web})_{RS}$, rear spar web weight, lb/side.
346	$(W_{cap})_{FS}$, front spar cap weight, lb/side.
347	$(W_{cap})_{RS}$, rear spar cap weight, lb/side.
348	$(\Delta W_{web})_{FS\ VF}$, front spar web weight increment for flutter design, lb/side.
349	$(\Delta W_{web})_{RS\ VF}$, rear spar web weight increment for flutter design, lb/side.
350	$(\Delta W_{rib})_{VF}$, intermediate rib or spar weight increment for flutter design, lb/side.
351	$(\Delta W_{misc\ skin})_{upr\ VF}$, upper cover miscellaneous skin weight increment for flutter design, lb/side.
352	$(\Delta W_{misc\ skin})_{lwr\ VF}$, lower cover miscellaneous skin weight increment for flutter design, lb/side.
353	$(W_{skin\ FS/RS})_{upr}$, weight of upper cover skin overhang material at front and rear spars, lb/side.
354	$(W_{skin\ FS/RS})_{lwr}$, weight of lower cover skin overhang material at front and rear spars, lb/side.
355	$(W_{misc})_{FS}$, weight of miscellaneous structure and attachment items for front spar, lb/side.
356	$(W_{misc})_{RS}$, weight of miscellaneous structure and attachment items for rear spar, lb/side.
357	$(W_{misc})_{rib}$, miscellaneous rib or spar structure weight, lb/side.
358	$(\Delta W_{skin\ chordwise})_{upr}$, incremental weight of upper cover skin splice or pad material along the structural chords of affected analysis stations, lb/side.

TABLE 233. TWT ARRAY, LOCATIONS 1 THROUGH 50 and 311 THROUGH 400, TORQUE-BOX WEIGHT INCREMENT DATA FOR PIVOT DESIGNS, SUBROUTINE DLPVT (CONT)

Array Location	Description
359	$(\Delta W_{skin\ chordwise})_{lwr}$, incremental weight of lower cover skin splice or pad material along the structural chords of affected analysis stations, lb/side.
360	$(\Delta W_{att})_{chordwise}$, attachment weight for chordwise cover splice or bulkheads at the affected analysis stations, lb/side.
361	W_{blhd}, weight of bulkheads at affected analysis stations, lb/side.
362	ΔW_{rib}, weight of intermediate ribs replaced with bulkhead ribs at affected analysis stations, multirib designs only, 0.0 for multispar or fulldepth honeycomb sandwich designs, lb/side.
363	W_{RR}, weight of root rib, lb/side.
364	$(W_{cap})_{RR}$, weight of root rib caps, lb/side.
365	$(W_{web})_{RR}$, weight of root rib web, lb/side.
366	$(W_{misc})_{RR}$, weight of miscellaneous structure and attachment items for root rib, lb/side.
367-377	Not used.
Locations 378 through 400 are used for storage and retrieval of geometry control station values and weight calculation constants computed during outer-panel torque-box and center-section analysis.	
378	$(\Delta W_{skin\ chordwise})_{upr}$, upper cover skin increment for chordwise splice and pads, center-section analysis only, lb/side.
379	$(\Delta W_{skin\ chordwise})_{lwr}$, lower cover skin increment for chordwise splice and pads, center-section analysis only, lb/side.
380	$(width_{TB})_{\emptyset B}$, structural width of torque-box at outboard analysis control station for current outer-panel torque-box panel, in. Also, $(\Delta W_{att})_{chordwise}$, cover splice or bulkhead pad weights for center-section analysis, lb/side.

TABLE 233. TWT ARRAY, LOCATIONS 1 THROUGH 50 AND 311 THROUGH 400, TORQUE-BOX WEIGHT INCREMENT DATA FOR PIVOT DESIGNS, SUBROUTINE DLPVT (CONT)

Array Location	Description
381	K_{width}, width factor for calculation of chordwise element weights, outer-panel and center-section analysis.
382	$(Y_{\Lambda\ TB})_{IB}$, inboard analysis control station for current outer-panel torque-box panel, in.
383	$(Y_{\Lambda\ TB})_{ØB}$, outboard analysis control station for current outer-panel torque-box panel, in.
384	$(\Delta Y_{\Lambda})/2.0$, one-half of affected panel span, in.
385	W_{IB}, weight at inboard station of affected panel for current structural element, lb/in.
386	$W_{ØB}$, weight at outboard station of affected panel for current structural element, lb/in.
387	$(W_{IB})_{ref}$, inboard station weight of reference outer-panel torque-box or center-section panel for current structural element, lb/in.
388	$(W_{ØB})_{ref}$, outboard station weight of reference outer-panel torque-box or center-section panel for current structural element, lb/in.
389	$(R_{\Lambda})_{IB}$, ratio of distance between affected panel inboard station and inboard control station of reference outer-panel torque-box or center-section panel to structural span of reference panel.
390	$(R_{\Lambda})_{ØB}$, outboard station factor for affected panel similar to location 389.
391	$(\Delta Y_{\Lambda})_{IB}$, distance between inboard station of affected panel and inboard control station of reference outer-panel torque-box panel, in.

TABLE 233. TWT ARRAY, LOCATIONS 1 THROUGH 50 AND 311 THROUGH 400, TORQUE-BOX WEIGHT INCREMENT DATA FOR PIVOT DESIGNS, SUBROUTINE DLPVT (CONCL)

Array Location	Description
392	$(\Delta Y_\Lambda)_{\emptyset B}$, distance between outboard station of affected panel and inboard control station of reference outer-panel torque-box panel, in.
393	$(\Delta Y_\Lambda)_{ref}$, span of reference outer-panel torque-box panel, in.
394	$(Y_\Lambda)_{IB}$, inboard station of affected panel, inboard lug-rib station or inboard outer-panel analysis station of current reference panel, in.
395	$(Y_\Lambda)_{\emptyset B}$, outboard station of affected panel, outboard lug-rib station or inboard outer-panel analysis station of current reference panel, or side-of-fuselage station for center-section, in.
396	$(Y_\Lambda)_{\emptyset B\ rib}$, structural station for inboard lug-rib, in.
397	$(Y_\Lambda)_{IB\ rib}$, structural station for outboard lug rib, in.
398	$(Y_{\emptyset B})_{rib}$, Y-coordinate of inboard lug-rib, in.
399	$(Y_{IB})_{rib}$, Y-coordinate of outboard lug-rib, in.
400	Intermediate calculation data.

TABLE 234. PT ARRAY, SUBROUTINE PIVØT

General information for array PT:

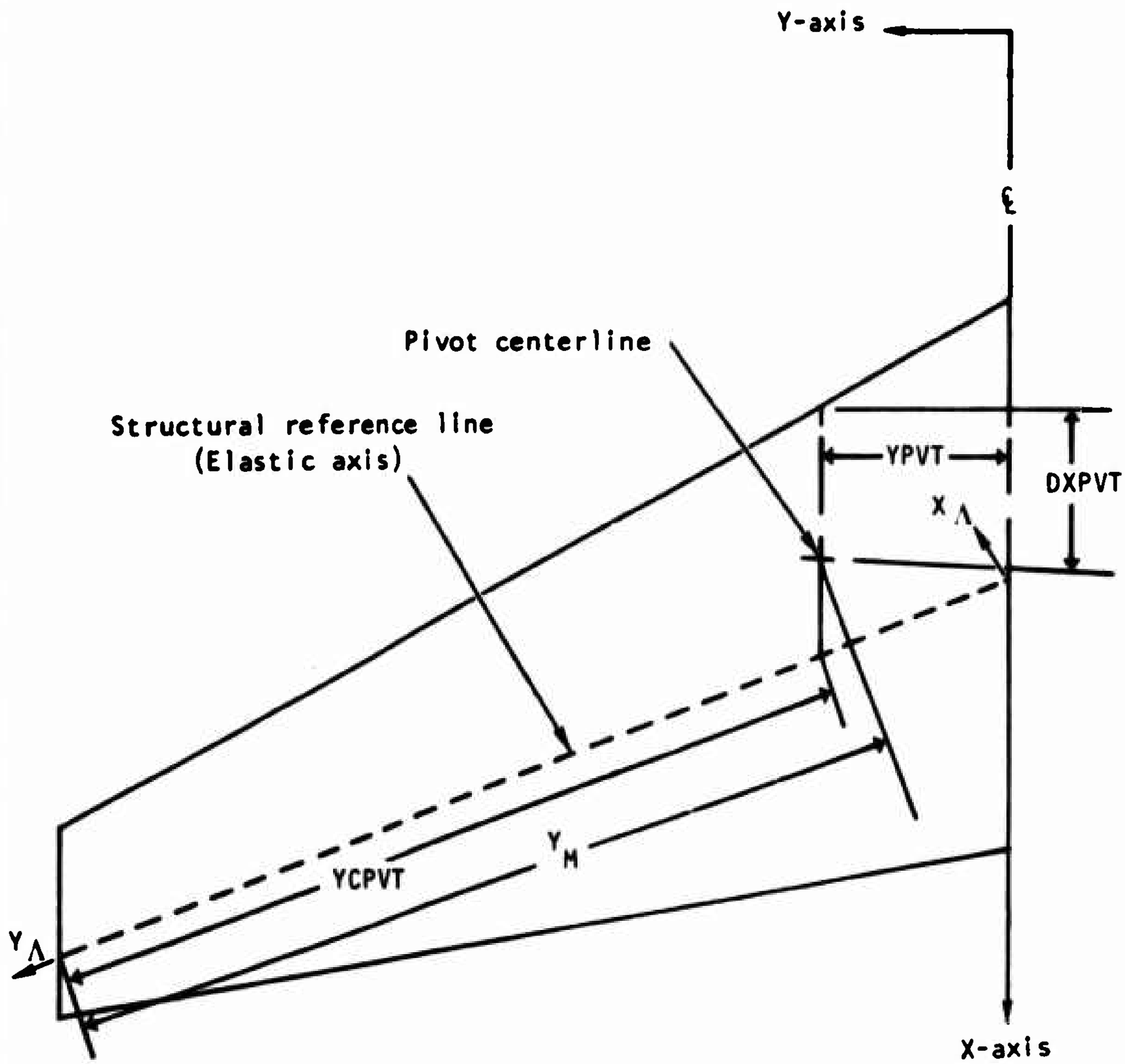
Blank common reference location = T(901)

Array size = 100 cells

Array PT in conjunction with array S (Table 235) is used for storage and retrieval of the calculated data for pivot structure analysis. The contents of PT and S are printed by subroutine PIVØT at the end of the pivot analysis under control of IP(26), case control card 1, column 26. The output is identified by the title "T at End Pivot." Contents of locations T(881) through T(1200) are printed with PT array starting at location 901, and S array at location 1001.

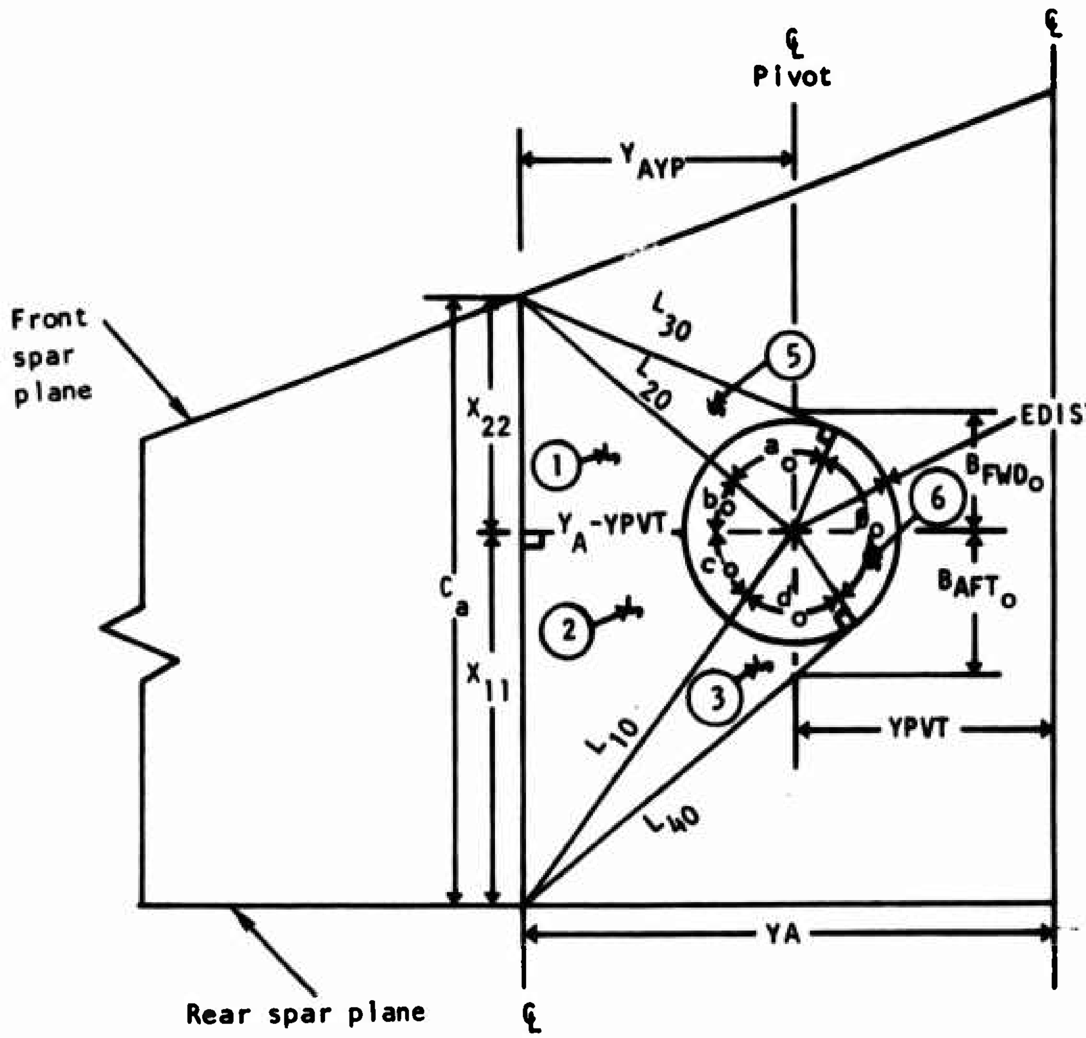
The included sketches, identified and referred to as sketches a through e, are included as part of this table to supplement the descriptions of each array location. The sketches are also referred to in the S array descriptions of Table 235.

Array Location	Variable	Sketch Ref	Description
1	YCPVT	a	Structural distance from tip to centerline of pivot parallel to elastic axis, in.
2	CKEC	-	Cube of inboard rib web thickness, in^3.
3	ARM	d	Couple-arm, distance between midpoints of outboard lugs at pivot centerline, in.
4	Y_M	a	Structural distance from tip station to line normal to the elastic axis passing through the pivot centerline, in.
5	DXPVT	a	Location of pivot centerline aft of local leading edge as fraction of pivot station chord.
6-7	-	-	Not used
8	PVTV	-	V_Λ, net ultimate design shear at pivot centerline computed at pivot station projection on elastic axis, lb.
9	PVTM	-	$M_{X\Lambda}$, net ultimate design bending moment at pivot station projection on elastic axis, in-lb.
10	PVTD	-	Mold line depth of wing at pivot station, in.
11-29	-	-	Not used
30	-	-	Tangent of rear spar sweep angle of reference planform.
31	XR_1	c	Difference between fuselage station of rear spar intercept at centerline and fuselage station of pivot, in.



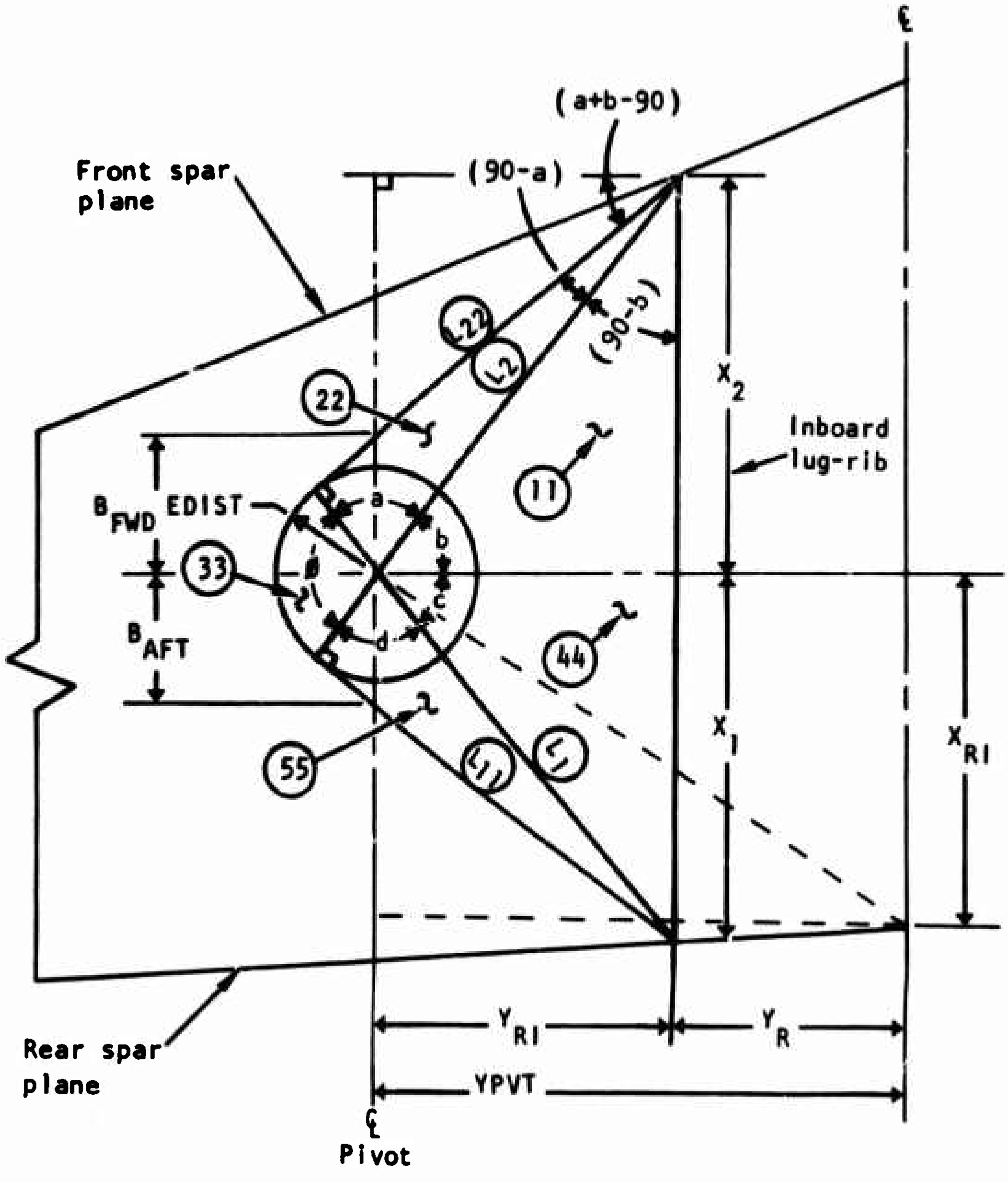
a. Wing and Pivot Geometry.

TABLE 234. PT ARRAY, SUBROUTINE PIVØT (CONT)

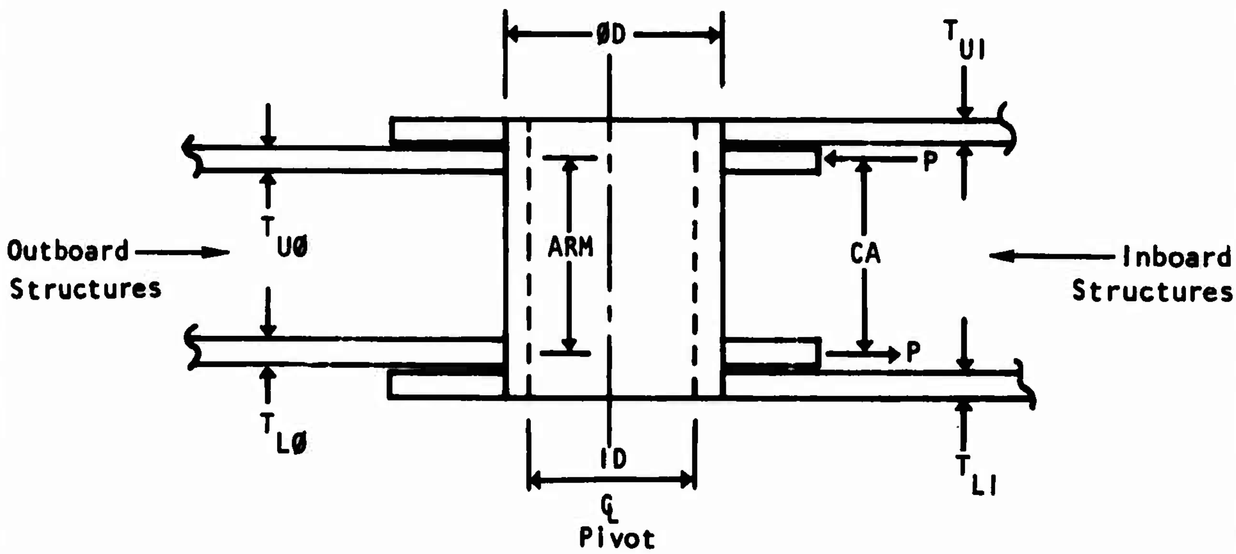


Outboard lug-rib

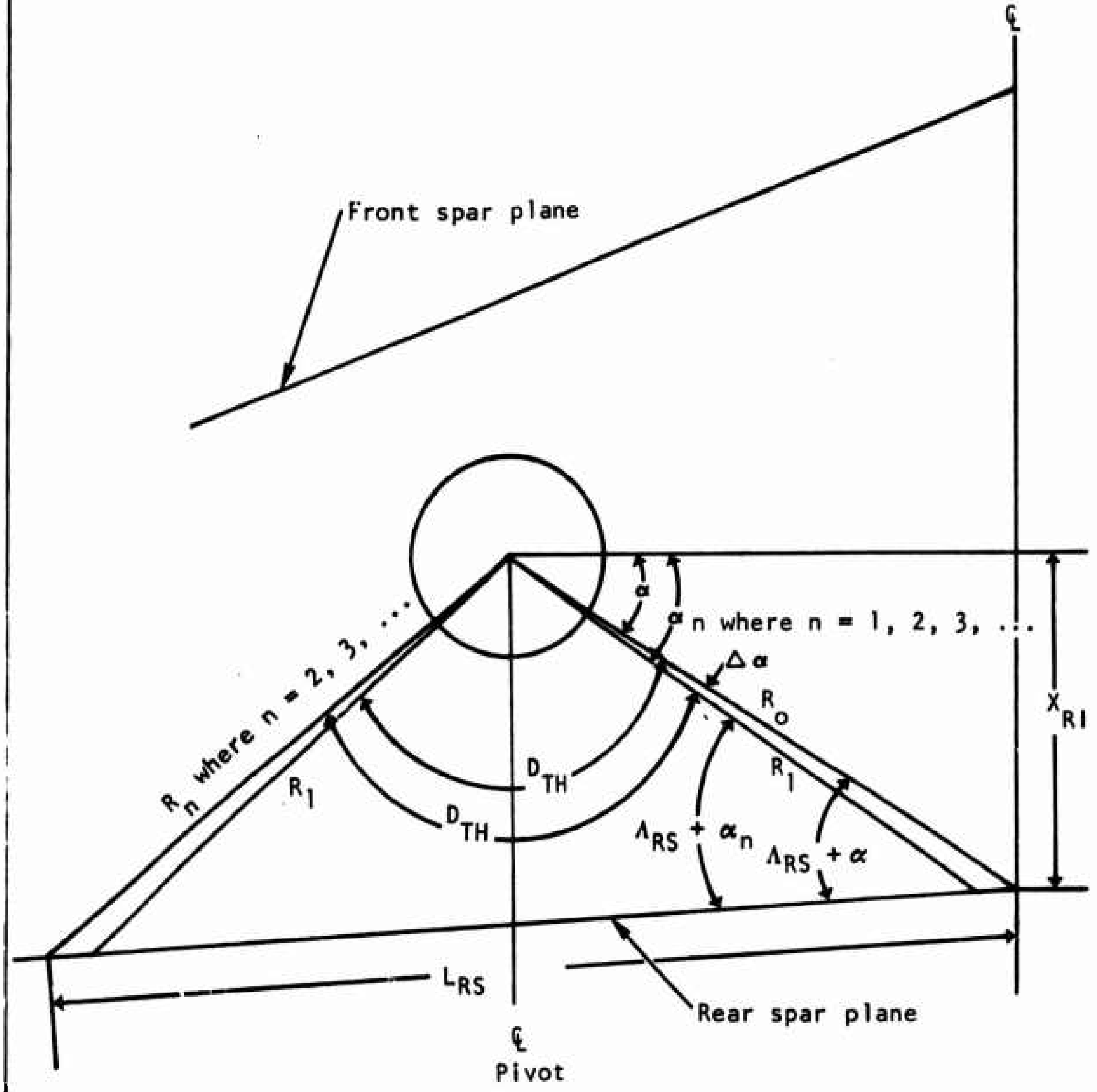
b. Outboard Lug Geometry.



c. Inboard Lug Geometry.



d. Pivot Structure Cross-Section.



e. Geometry Parameters for Pivot Rotation.

TABLE 234. PT ARRAY, SUBROUTINE PIVØT (CONT)

Array Location	Variable	Sketch Ref	Description
32	R_o	e	Length of line labeled "R_o," line passing through pivot centerline and rear spar intercept of planform centerline, in.
33	Cos (α)	e	Cosine of angle labeled "α."
34	Sin (α)	e	Sine of angle labeled "α."
35	Cos (Λ_{RS})	-	Cosine of rear spar sweep angle.
36	Sin (Λ_{RS})	-	Sine of rear spar sweep angle.
37	Sin $(\Lambda_{RS} + \alpha)$	e	Sine of sum of rear spar sweep angle and angle labeled "α."
38	D_{TH}	e	Difference between most-aft and most-forward sweep positions of leading edge, radians.
39	SINDTH	-	Sine of D_{TH}.
40	CØSDTH	-	Cosine of D_{TH}.
41	-	-	Not used.
42	X_1	c	Length of line labeled "X_1," in. When $Y_R = 0$, this equals X_{R1}.
43	R_{n-1}	e	Refer to location 32, in.
44	-	-	Not used.
45	R_n	e	Length of line labeled "R_n," in. e.g.: 1st pass - $R_n = R_o$; 2nd pass - $R_n = R_1$; 3rd pass - $R_n = R_2$
46	Cos (α_n)	e	Cosine of angle labeled "α_n."
47	Sin (α_n)	e	Sine of angle labeled "α_n."
48	Sin $(\Delta\alpha)$	e	Sine of angle labeled "$\Delta\alpha$," $(\alpha - \alpha_n)$.
49	Cos $(\Delta\alpha)$	e	Cosine of angle labeled "$\Delta\alpha$."
50	Sin $(D_{TH} + \Delta\alpha)$	e	Sine of $(D_{TH} + \Delta\alpha)$.
51	Cos $(D_{TH} + \Delta\alpha)$	e	Cosine of $(D_{TH} + \Delta\alpha)$.
52	-	-	Ratio of squares of $\mathrm{Sin}(D_{TH} + \Delta\alpha)$ and $\mathrm{Sin}(\Lambda_{RS} + \Delta\alpha)$.
53	$\frac{R_n + 1}{R_o}$	-	Ratio of $(R_n + 1)$ to R_o.

TABLE 234. PT ARRAY, SUBROUTINE PIVØT (CONT)

Array Location	Variable	Sketch Ref	Description
54	EØD	-	Ratio of edge distance to outer-diameter.
55	DØT	-	Ratio of outer-diameter to lug thickness.
56	SØD	-	Required outer-diameter based on input bearing stress, in.
57-59	-	-	Not used.
60	T_{UI}	d	Thickness of upper inboard lug at pivot centerline, in.
61	T_{LI}	d	Thickness of lower inboard lug at pivot centerline, in.
62	$T_{UØ}$	d	Thickness of upper outboard lug at pivot centerline, in.
63	$T_{LØ}$	d	Thickness of lower outboard lug at pivot centerline, in.
64	P	d	Couple force on outboard lug for design bending moment, lb.
65	F_{BR}	-	Allowable bearing stress for pivot bearings, psi.
66	ØD	d	Outer-diameter of pivot pin, in.
67	% F_{TU}	-	Tension cutoff stress for lug design based on input factor in D(189), variable PERFTU, psi.
68	ID	d	Inner-diameter of pivot pin, in.
69	EDIST	b,c	Pivot lug edge distance, in.
70	Y_R	c	Y-coordinate, inboard rib, in.
71	Y_{RIB}	-	Distance from tip station to inboard rib along elastic axis, in.
72-74	-	-	Not used. (Any data in these locations not pertinent to pivot analysis.)
75	M_{RIB}	-	Net ultimate design bending moment at inboard rib for most-forward planform position, in-lb.
76	T_{UR}	-	Thickness of inboard upper lug at inboard rib, in.
77	T_{LR}	-	Thickness of inboard lower lug at inboard rib, in.
78	D_{RIB}	-	Depth of section at inboard rib, in.
79	C_{ARIB}	-	Depth of inboard rib, in.

TABLE 234. PT ARRAY, SUBROUTINE PIVØT (CONT)

Array Location	Variable	Sketch Ref	Description
80	W_{RIB}	-	Width of inboard rib, in.
81	$\tan \Lambda_{LE}$	-	Tangent of sweep of leading edge element line for reference position.
82	$f(\Lambda_{LE})$	-	A function based on sweep angle of leading edge and used to estimate bending moment at pivot in swept position based on known bending moment in forward position, used in conjunction with value in location 86.
83	T_{RIBM}	-	Maximum required web thickness for inboard rib for all sweep positions analyzed, in.
84	$\Sigma\Delta\theta$	-	Sum of total incremental sweep angles between forward and aft positions, radians.
85	$\Delta\theta$	-	Incremental sweep angle required to sweep movable panel through each sweep position through the most-aft position, radians.
86	$f(\Lambda_{LE} + \alpha)$	-	Definition same as location 82, but angle as sweep of leading edge in swept position.
87	M_{RIB}'	-	Bending moment at rib for sweep position being analyzed, in-lb.
88	$\Lambda_{LE\ FWD}$	-	Sweep angle of leading edge, most-forward position, radians.
89	$\Lambda_{LE\ AFT}$	-	Sweep angle of leading edge, most-aft position, radians.
90-91	-	-	Not used.
92	-	-	Sine of leading edge sweep angle for position being analyzed.
93	-	-	Width of inboard rib divided by couple arm at inboard rib (rib aspect ratio).
94	K_{RIB}	-	Buckling coefficient for rib web. Used in shear buckling equation for web with simply supported edges.
95	-	-	Not used.
96	T_{RIB}	-	Thickness of inboard rib web based on loads at sweep position being analyzed, in.

TABLE 234. PT ARRAY, SUBROUTINE PIVØT (CONCL)

Array Location	Variable	Sketch Ref	Description
97	-	-	Not used.
98	Y_{RI}	c	Distance between inboard rib station and pivot station, in.
99	-	-	Distance between chord element lines of pivot and rear spar plane at centerline of reference planform, in.
100	SPAN	-	b/2, semi-span of reference planform, in.
			NOTE: YPVT is Y-coordinate of pivot centerline, blank common reference location = T(900), in.

TABLE 235. S ARRAY, SUBROUTINE PIVØT

General information for array S:

Blank common reference location = T(1001)

Array size = 200 cells

Array S in conjunction with array PT (Table 234) is used for storage and retrieval of the calculated data for pivot structure analysis. The contents of S and PT are printed by subroutine PIVØT at the end of the pivot analysis under control of IP(26), case control card 1, column 26. The output is identified by the title "T at End Pivot." Contents of locations T(881) through T(1200) are printed, with S array starting at location 1001 and PT array at location 901.

Sketches for the identification letters a through e referred to in array descriptions that follow are included with the PT array descriptions. Refer to Table 234 for the sketches and a pictorial representation of dimensional data stored in array S.

Array Location	Variable	Sketch Ref	Description
1	X_1	c	Length of line labeled "X_1" of inboard lug, in.
2	X_2	c	Length of line labeled "X_2" of inboard lug, in.
3	L_1	c	Length of line labeled "L_1" of inboard lug and equals square root of $(X_1^2 + Y_{RI}^2)$, in.
4	L_2	c	Length of line labeled "L_2" of inboard lug and equals square root of $(X_2^2 + Y_{RI}^2)$, in.
5	L_{11}	c	Length of line labeled "L_{11}" of inboard lug and equals square root of $(L_1^2 - EDIST^2)$, in.
6	L_{22}	c	Length of line labeled "L_{22}" of inboard lug and equals square root of $(L_2^2 - EDIST^2)$, in.
7	-	c	Sum of two products $((L_{22})(Y_{RI}) + (EDIST)\ (X_2))$, in^2.

TABLE 235. S ARRAY, SUBROUTINE PIVØT (CONT)

Array Location	Variable	Sketch Ref	Description
8	-	c	Difference of two products $((EDIST)(Y_{RI}) - (L_{22})(X_2))$, in^2.
9	TAN (a + b)	c	Tangent of angles (a + b).
10	-	c	Sum of products $((LL_{11})(Y_{RI}) + (EDIST)(X_1))$, in^2.
11	-	c	Difference of two products $((EDIST)(Y_{RI}) - (L_{11})(X_1))$, in^2.
12	TAN (d + c)	c	Tangent of angles (d + c).
13	-	-	Counter for iteration loop in subroutine TEE.
14	Ø	c	Angle labeled "Ø" on inboard lug, radians.
15	A	c	Twice area of triangles "55" and "22" and circular sector "33" of inboard lug, computed as EDIST $(L_{11} + L_{22} + Ø \cdot EDIST)$, in^2.
16	A_{INB}	c	Total area of inboard lug less area of hole for pin, computed as $1/2\ (A + (X_1 + X_2)\ Y_{RI}) - \pi(ØD)^2/4.0$, in^2.
17	B_{FWD}	c	Effective inboard lug width forward of pin hole at pivot centerline, computed as $X_2 - ØD/2 + Y_{RI}/TAN(a + b)$, in.
18	B_{AFT}	c	Effective inboard lug width aft of pin hole at pivot centerline, computed as $X_1 - ØD/2 + Y_{RI}/TAN(d + c)$, in.
19	B_X	c	Total effective inboard lug width at pivot centerline, $(B_{AFT} + B_{FWD})$, in.
20	B	-	Smaller of the two effective widths (B_{FWD}, B_{AFT}) for use in subroutines TEE and TEL when lug is being sized at pivot centerline, or width of total lug when sizing is for wider portion of lug, in.
21	A	-	Length of lug being analyzed by subroutines TEE and TEL, in.
22	CA	d	Couple arm at point being analyzed by subroutines TEE and TEL, in.
23	M_{xA}	-	Net ultimate design bending moment at point being analyzed by subroutines TEE and TEL, in-lb.

TABLE 235. S ARRAY, SUBROUTINE PIVØT (CONT)

Array Location	Variable	Sketch Ref	Description
24	L_{RS}	e	Length of rear spar between spar intercepts of R_n and R_o, in.
25	Y_A	b	Location of outboard lug-rib referenced to vehicle centerline, in.
26	-	-	Width of structural box at vehicle centerline in aerodynamic reference system, in.
27	C_a	b	Width of structural box at outboard lug-rib, in.
28	-	b	Distance between pivot and rear spar plane at pivot centerline, in.
29	X_{11}	b	Length of line labeled "X_{11}" of outboard lug, in.
30	X_{22}	b	Length of line labeled "X_{22}" of outboard lug, in.
31	L_{20}	b	Length of line labeled "L_{20}" of outboard lug, in.
32	L_{30}	b	Length of line labeled "L_{30}" of outboard lug, in.
33	L_{40}	b	Length of line labeled "L_{40}" of outboard lug, in.
34	-	b	Sum of two products $((Y_{AYP})(L_{30}) + (X_{22})(EDIST))$, in^2.
35	Y_{AYP}	b	Length of outboard lug measured from pivot centerline to outboard lug-rib, in.
36	-	b	Difference of two products $((EDIST)(Y_{AYP}) - (L_{30})(X_{22}))$, in^2.
37	TAN $(a_o + b_o)$	b	Tangent of angle $(a_o + b_o)$.
38	-	b	Sum of two products $((EDIST)(X_{11}) + (L_{40})(Y_{AYP}))$, in^2.
39	-	b	Difference of two products $((EDIST)(Y_{AYP}) - (L_{40})(X_{11}))$, in^2.
40	TAN $(c_o + d_o)$	b	Tangent of angle $(c_o + d_o)$.
41	-	-	Not used.
42	$Ø_o$	b	Angle labeled "$Ø_o$" on outboard lug, radians.
43	A_o	b	Twice area of triangles "3" and "5" and circular sector "6" of outboard lug, in^2.
44	$A_{ØUT}$	b	Total area of outboard lug less area of hole for pivot pin, in^2.

TABLE 235. S ARRAY, SUBROUTINE PIVØT (CONT)

Array Location	Variable	Sketch Ref	Description
45	B_{FWD_O}	b	Effective outboard lug width forward of pin hole at pivot centerline, in.
46	B_{AFT_O}	b	Effective outboard lug width aft of pin hole at pivot centerline, in.
47	-	-	Wing box depth at outboard lug-rib, in.
48	-	-	Couple arm to react design bending load at outboard rib, in.
49	$T_{UØR}$	-	Thickness of upper outboard lug at outboard rib location, in.
50	$T_{LØR}$	-	Thickness of lower outboard lug at outboard rib location, in.
51	$Y_{RIBØ}$	-	Structural distance between tip station and outboard lug-rib, in.
52-53	-	-	Not used.
54	-	-	Difference between pin outer-diameter from current sizing pass and pin outer-diameter from previous sizing, pass, in.
55	$ØD_1$	-	Outer-diameter of pivot pin from previous sizing pass, in.
56	K	-	Buckling coefficient for plate shear buckling equation based on plate aspect ratio of lug from subroutine TEE.
57	T_{MAX}	-	Maximum thickness of lug from all sweep positions analyzed with subroutine TEE, in.
58	-	-	Difference between leading edge sweep angle of current position and initial forward position, radians.
59	-	-	Not used.
60	$\Delta\Lambda$	-	Incremental sweep angle to rotate movable panel to aft position, subroutine TEE, radians.
61	$M_{x\Lambda}$	-	Net ultimate design bending moment at current position being analyzed by subroutine TEE, in-lb.
62	Λ_{LE}	-	Sweep angle of leading edge at sweep position currently being analyzed by subroutine TEE, radians.
63	-	-	Not used.
64	-	-	Sine of current leading edge sweep angle, subroutine TEE.

TABLE 235. S ARRAY, SUBROUTINE PIVØT (CONT)

Array Location	Variable	Sketch Ref	Description
65	-	-	Cosine of current leading edge sweep angle, subroutine TEE.
66	P_s	-	Side load applied to lug at current sweep position, subroutine TEE, lb.
67	P_c	-	Compression load applied to lug at current sweep position, subroutine TEE, lb.
68	-	-	Intermediate calculation for location 69.
69	A	-	Term "A" for a cubic equation involving thickness of lug under combined shear and compression loads to insure zero or positive margins, subroutine TEE.
70	B	-	Term "B" of preceding cubic expression, defined as: $\frac{A}{(t^3)^{3/2}} + \frac{B}{t^3} = 1.0$ Let $X = t^3$, then $\frac{A}{(X)^{3/2}} + \frac{B}{X} = 1$ or $\frac{A}{\sqrt{X}} + B = X$ or $\sqrt{X}\,(X-B) - A = 0 = f(X)$
71	$\sqrt{X}$	-	Square root of X.
72	f(X)	-	Function of $X = \sqrt{X}\,(X-B)-A$, subroutine TEE.
73	X	-	Assumed value for X, subroutine TEE.

TABLE 235. S ARRAY, SUBROUTINE PIVØT (CONT)

Array Location	Variable	Sketch Ref	Description
74	T_{LUG}	-	Thickness of lug for current sweep position being analyzed by subroutine TEE, in.
75	-	-	Sweep angle of leading edge at sweep position currently being analyzed by subroutine TEE, radians.
76	K	-	Buckling coefficient for plate shear buckling equation based on plate aspect ratio of lug, subroutine TEL.
77	T_{MAX}	-	Maximum thickness of lug from all sweep positions analyzed by subroutine TEL, in.
78	-	-	Difference between sweep angles of leading edge in current sweep position being analyzed by subroutine TEL and initial forward sweep position, radians.
79	$M_{x\Lambda}$	-	Net ultimate design bending moment at current sweep position being analyzed by subroutine TEL, in-lb.
80	Λ_{LE}	-	Current sweep angle of leading edge, subroutine TEL, radians.
81	-	-	Not used.
82	-	-	Sine of current leading edge sweep angle, subroutine TEL.
83	-	-	Cosine of current leading edge sweep angle subroutine TEL.
84	P_s	-	Side load applied to lug at current sweep position, subroutine TEL, lb.
85	P_t	-	Tension load applied to lug at current sweep position, subroutine TEL, lb.
86-87	-	-	Not used.
88	A	-	Term "A" for cubic equation involving lug thickness for lug under combined shear and tension loads to insure positive or zero margins, subroutine, TEL.
89	B	-	Term "B" for preceding cubic equation, subroutine TEL.
90	X_o	-	Assumed value of X for iterative solution of cubic equation by subroutine TEL, equation defined as: $f(X) = 0 = X - (A + BX^2)^{1/3}$

TABLE 235. S ARRAY, SUBROUTINE PIVØT (CONT)

Array Location	Variable	Sketch Ref	Description
91	X_1	-	Calculated value for X, using assumed value in location 90, subroutine TEL.
92	$X_1 - X_o$	-	Difference between calculated and assumed X, subroutine TEL.
93	T_{LUG}	-	Thickness of lug for current sweep position being analyzed by subroutine TEL, in.
94	-	-	Not used.
95	-	-	Weight of inboard lugs, lb/side.
96	-	-	weight of outboard lugs, lb/side.
97	-	-	Weight of pivot pin, lb/side.
98	-	-	Weight of inboard, lug rib, lb/side.
99	Y_{RIB_o}	-	Structural distance between tip station and outboard lug-rib, in.
100-120	-	-	Not used.
121	ID^2	-	Square of inner-diameter of pivot pin, in^2.
122	L_{10}	b	Length of line labeled "L_{10}" of outboard lug, in.
123	a + b	c	Sum of angles labeled "a" and "b" of inboard lug, radians.
124	d + c	c	Sum of angles labeled "d" and "c" of inboard lug, radians.
125	$a_o + b_o$	b	Sum of angles labeled "a_o" and "b_o" of outboard lug, radians.
126	$c_o + d_o$	b	Sum of angles labeled "c_o" and "d_o" of outboard lug, radians.
127	F_{BR_O}	-	Bearing stress from previous sizing pass, psi.
128	-	-	Difference between current and previous bearing stresses, psi.
129	c_o	b	Angle labeled "c_o" of outboard lug when Y_{AYP} equals EDIST, radians.
130	α	e	Angle labeled "α," radians.
131	$\Delta\psi$	b,e	Difference between 2π and sum of angles c_O, α, and D_{TH}, radians.
132	-	b,e	Sine of $\Delta\psi$
133	-	b,e	Cosine of $\Delta\psi$
134	-	b,e	Sine of $(\alpha + \Delta\psi)$.
135	-	b,e	Cosine of $(\alpha + \Delta\psi)$.
136	-	b,e	Sine of $(\Lambda_{RS} + \Delta\psi)$.
137	-	b,e	Ratio of squares of sines of angles D_{TH} and $(\Lambda_{RS} + \psi)$.

TABLE 235. S ARRAY, SUBROUTINE PIVØT (CONCL)

Array Location	Variable	Sketch Ref	Description
138	-	-	Intermediate calculation for estimating location of inboard lug-rib.
139	L_1	c	Estimated length of L_1 when Y_{AYP} is less than EDIST, in.
140	-	b,c	Analysis code, value of (+1) indicates that Y_A and Y_R were estimated by logic for the condition: Y_{AYP} less than EDIST.
141	-	-	Not used.
142	-	-	Leading edge sweep angle for sweep position yielding maximum upper inboard lug thickness at pivot centerline, radians.
143	-	-	Leading edge sweep angle for sweep position yielding maximum lower inboard lug thickness at pivot centerline.
144	-	-	Leading edge sweep angle for sweep position yielding maximum upper inboard lug thickness at inboard lug-rib, radians.
145	-	-	Leading edge sweep angle of sweep position yielding maximum lower inboard lug thickness at inboard lug-rib, radians.
146	-	-	Leading edge sweep angle of sweep position yielding maximum upper outboard lug thickness at pivot centerline, radians.
147	-	-	Leading edge sweep angle of sweep position yielding maximum lower outboard lug thickness at pivot centerline, radians.
148	-	-	Leading edge sweep angle of sweep position yielding maximum upper outboard lug thickness at outboard lug-rib, radians.
149	-	-	Leading edge sweep angle of sweep position yielding maximum lower outboard lug thickness at outboard lug-rib, radians.
150-154	-	-	Not used.
155	f'(X)	-	First derivative of f(X) defined for location 70.
156	f''(X)	-	Second derivative of f(X) defined for location 70.
157	-	-	An intermediate calculated value used in estimating a new value of X based on previous estimate of X.
158-200	-	-	Not used.

TABLE 236. TSS ARRAY, TOTAL WEIGHT SUMMARY DATA, SUBROUTINES TBØPT AND ATBØPT

General information for array TSS:

Blank common reference location = T(1961)

Array size = 100 cells

Total calculated weight summary information for the three gross weight points that can be analyzed by the wing and empennage module is transmitted from the structural synthesis/weight analysis overlays to the output data processing overlay by way of mass storage file 1, records 184 through 189. Subroutine TBØPT, overlay (9,0), for metallic designs, and subroutine ATBØPT, overlay (18,0), for advanced composite designs, create these records at the conclusion of the final iteration pass for each gross weight. Array TSS is used during the data processing operations by these subroutines.

Two weight summary data sets are created for each gross weight - one containing "fixed surface" data and the other containing variable-sweep surface data, including pivot structure summary data and "fixed structure" weight increments. Each set is stored in consecutive records on mass storage file 1; records 184, 185, and 186 for gross weight 1, 2, and 3 "fixed surface" data sets and records 187, 188, and 189 for gross weight 1, 2, and 3 variable-sweep data sets. The data sets are recreated in array CD, locations 400 through 699 and 800 through 1099, by subroutine WØDATA in overlay (17,0) and used by subroutine PRTD to create array TS data during final data processing of module outputs.

The first data set is created from arrays TWT and TSS, which contain weight summary information for the surface outer-panel components and center-section as computed by subroutines WTCAL and CSECW. The second data set is created from the output information of subroutine DLPVT stored in arrays TWT and TSS.

Array TSS is set to 0.0 values before data processing for each set is initiated. Array locations used for storage or center-section and variable-sweep subsets will contain 0.0 values if these structures are not analyzed. Records 184 through 189 will also contain 0.0 values for gross weight points not analyzed. These records are initialized to 0.0 values by subroutine PRØG, overlay (9,0), or ACPRØG, overlay (18,0).

The two versions of array TSS are described in the following in separate blocks. All weights are computed in terms of pounds per air vehicle values.

TABLE 236. TSS ARRAY, TOTAL WEIGHT SUMMARY DATA, SUBROUTINES TBØPT AND ATBØPT (CONT)

Array Location	Description	Source
The "fixed surface" data set is described in the following. Locations 1 through 50 contain outer-panel data derived from array TWT (Table 230). Locations 51 through 100 contain center-section data from the subroutine CSECW output data version of array TSS.		
1	ΣW_{TB}, total torque-box weight.	TWT(1)
2	$(\Sigma W_{cov})_{upr}$, total upper cover weight.	TWT(2)
3	$(\Sigma W_{cov})_{lwr}$, total lower cover weight.	TWT(3)
4	$(\Sigma \Delta W_{TB})_{VF}$, total torque-box weight increment for flutter design.	TWT(4)
5	ΣW_{rib}, total intermediate rib or spar weight.	TWT(5)
6	ΣW_{FS}, total front spar weight.	TWT(6)
7	ΣW_{RS}, total rear spar weight.	TWT(7)
8	ΣW_{misc}, total miscellaneous structure and attachment weight.	TWT(8)
9	$(W_{skin})_{upr}$, upper cover skin weight.	TWT(9)
10	$(W_{str})_{upr}$, upper cover stringer or cap weight.	TWT(10)
11	$(W_{misc\ skin})_{upr}$, upper cover miscellaneous skin weight.	TWT(11)
12	$(W_{skin})_{lwr}$, lower cover skin weight.	TWT(12)
13	$(W_{str})_{lwr}$, lower cover stringer or cap weight.	TWT(13)
14	$(W_{misc\ skin})_{lwr}$, lower cover miscellaneous skin weight.	TWT(14)
15	$(W_{cap})_{FS}$, front spar cap weight.	TWT(15)
16	$(W_{web})_{FS}$, front spar web weight.	TWT(16)
17	$(W_{cap})_{RS}$, rear spar cap weight.	TWT(17)
18	$(W_{web})_{RS}$, rear spar web weight.	TWT(18)
19	$(\Delta W_{skin})_{upr\ VF}$, upper cover skin weight increment for flutter design.	TWT(19)
20	$(\Delta W_{str})_{upr\ VF}$, upper cover stringer or cap weight increment for flutter design.	TWT(20)

TABLE 236. TSS ARRAY, TOTAL WEIGHT SUMMARY DATA, SUBROUTINES TBØPT AND ATBØPT (CONT)

Array Location	Description	Source
21	$(\Delta W_{misc\ skin})_{upr\ VF}$, upper cover miscellaneous skin weight increment for flutter design.	TWT(21)
22	$(\Delta W_{skin})_{lwr\ VF}$, lower cover skin weight increment for flutter design.	TWT(22)
23	$(\Delta W_{str})_{lwr\ VF}$, lower cover stringer or cap weight increment for flutter design.	TWT(23)
24	$(\Delta W_{misc\ skin})_{lwr\ VF}$, lower cover miscellaneous skin increment for flutter design.	TWT(24)
25	$(\Delta W_{rib})_{VF}$, intermediate rib or spar weight increment for flutter design.	TWT(25)
26	$(\Delta W_{web})_{FS\ VF}$, front spar web weight increment for flutter design.	TWT(26)
27	$(\Delta W_{web})_{RS\ VF}$, rear spar web weight increment for flutter design.	TWT(27)
28	$(\Delta W_{att})_{VF}$, miscellaneous cover attachment weight for flutter design.	TWT(28)
29	$(\Delta W_{misc})_{rib\ VF}$, intermediate rib or spar miscellaneous structure items weight increment for flutter design.	TWT(29)
30	W_{blhd}, bulkhead weight.	TWT(30)
31	W_{RR}, root rib weight.	TWT(35)
32	$(W_{cap})_{RR}$, root rib cap weight.	TWT(36)
33	$(W_{web})_{RR}$, root rib web weight.	TWT(37)
34	$(W_{misc})_{RR}$, root rib miscellaneous structure and attachment weight.	TWT(38)
35	$W_{shear\ ftg}$, outer panel-to-fuselage shear-tie fitting weight.	TWT(39)
36	$\Sigma W_{SURFACE}$, total surface weight, outer-panel and center section.	TWT(40)
37	ΣW_{OPNL}, total outer-panel weight.	TWT(41)
38	0.0	TWT(42)

TABLE 236. TSS ARRAY, TOTAL WEIGHT SUMMARY DATA, SUBROUTINES TBØPT AND ATBØPT (CONT)

Array Location	Description	Source
39	ΣW_{C-SEC}, total center section weight.	TWT(43)
40	ΣW_{OPNL}, total outer panel weight.	TWT(45)
41	ΣW_{TB}, total torque-box weight.	TWT(46)
42	ΣW_{LE}, total leading edge weight	TWT(47)
43	ΣW_{TE}, total trailing edge weight.	TWT(48)
44	ΣW_{MISC}, total outer panel secondary structure weight.	TWT(49)
45	ΣW_{TIP}, total tip weight.	TWT(50)
46	$\Sigma \Delta W_{T-tail}$, total weight increment for T-tail designs	TWT(51)
47	$\Sigma \Delta W_{VF}$, total weight increment for flutter design.	TWT(52)
48	$\Sigma \Delta W_{CDL}$, total weight increment for concentrated mass provisions.	TWT(53)
49	$(\Sigma \Delta W_{rib})_{T-tail}$, total weight increment of rib structures for T-tail horizontal and vertical tail surfaces.	TWT(67)
50	$(\Sigma \Delta W_{cone})_{T-tail}$, total tail cone weight for T-tail designs.	TWT(70)
51	ΣW_{C-SEC}, total center section weight.	TSS(1)
52	W_{MISC}, total center section secondary structure weight.	TSS(2)
53	$(W_{cov})_{upr}$, upper cover weight for center section.	TSS(3)
54	$(W_{cov})_{lwr}$, lower cones weight for center section.	TSS(4)
55	W_{rib}, intermediate rib or spar weight for center-section.	TSS(5)
56	W_{FS}, front spar weight for center section.	TSS(6)
57	W_{RS}, rear spar weight for center-section.	TSS(7)
58	W_{misc}, miscellaneous structure and attachment weight for center section.	TSS(8)
59	$(W_{skin})_{upr}$, upper cover skin weight for center section.	TSS(9)
60	$(W_{str})_{upr}$, upper cover stringer or cap weight for center section.	TSS(10)

TABLE 236. TSS ARRAY, TOTAL WEIGHT SUMMARY DATA, SUBROUTINES TBØPT AND ATBØPT (CONT)

Array Location	Description	Source
61	$(W_{misc\ skin})_{upr}$, upper cover miscellaneous skin weight for center-section.	TSS(11)
62	$(W_{skin})_{lwr}$, lower cover skin weight for center-section.	TSS(12)
63	$(W_{str})_{lwr}$, lower cover stringer or cap weight for center-section.	TSS(13)
64	$(W_{misc\ skin})_{lwr}$, lower cover miscellaneous skin weight for center-section.	TSS(14)
65	$(W_{cap})_{FS}$, front spar cap weight for center-section.	TSS(15)
66	$(W_{web})_{FS}$, front spar web weight for center-section.	TSS(16)
67	$(W_{cap})_{RS}$, rear spar cap weight for center-section.	TSS(17)
68	$(W_{web})_{RS}$, rear spar web weight for center-section.	TSS(18)
69	$(W_{rib})_{C/L}$, centerline rib weight for center-section.	TSS(19)
70	W_{blhd}, bulkhead weight for center-section.	TSS(20)
71	0.0	TSS(21)
72	0.0	TSS(22)
73	0.0	TSS(23)
74	0.0	TSS(24)
75	0.0	TSS(25)
76	$(\text{Width})_{b_1/2}$, center-section box width at side-of-body station, in.	TSS(26)
77	$(\text{Width})_{C/L}$, center-section box width at centerline, in.	TSS(27)
78	$b_1/2$, side-of-body station, in.	TSS(28)
79	$D_{b_1/2}$, center-section depth as side-of-body station, in.	TSS(29)
80	$D_{C/L}$, center-section depth at centerline, in.	TSS(30)
81	$\rho\ b_1/2$, factor for weight calculation, lb/in.^{2}	TSS(31)
82	$(K_{cap})_{C/L}$, geometry factor for centerline rib cap weight.	TSS(32)
83	$(K_{web})_{C/L}$, geometry factor for centerline rib web weight.	TSS(33)
84	K_{cov}, geometry factor for center-section cover weight.	TSS(34)

TABLE 236. TSS ARRAY, TOTAL WEIGHT SUMMARY DATA, SUBROUTINES TBØPT AND ATBØPT (CONT)

Array Location	Description	Source
85	K_{rib}, geometry factor for center section intermediate rib or spar weight.	TSS(35)
86	$(W_{cap})_{C/L}$, centerline rib cap weight.	TSS(36)
87	$(W_{web})_{C/L}$, centerline rib web weight.	TSS(37)
88	$(W_{misc})_{C/L}$, centerline rib miscellaneous weight.	TSS(38)
89	$(K_{misc})_{FS/RS}$, geometry factor for front and rear spar miscellaneous item weight.	TSS(39)
90	$(K_{web})_{FS/RS}$, geometry factor for front and rear spar weight.	TSS(40)
91	0.0	TSS(41)
92	0.0	TSS(42)
93	0.0	TSS(43)
94	0.0	TSS(44)
95	0.0	TSS(45)
96	0.0	TSS(46)
97	0.0	TSS(47)
98	0.0	TSS(48)
99	0.0	TSS(49)
100	0.0	TSS(50)
The variable-sweep surface data set is described in the following. Locations 1 through 50 contain weights of outer panel torque-box structures to be replaced with pivot structures, derived from array TWT (Table 233). Locations 51 through 75 contain weights of center section structures to be replaced with pivot structures, derived from the subroutine DLPVT output data version of array TSS. Locations 76 through 100 contain pivot structure weight and design data.		
1	$\Delta\Sigma W_{TB}$, total torque-box weight to be deleted.	TWT(1)
2	$\Delta(\Sigma W_{cov})_{upr}$, total upper cover weight to be deleted.	TWT(2)
3	$\Delta(\Sigma W_{cov})_{lwr}$, total lower cover weight to be deleted.	TWT(3)
4	$\Delta(\Sigma \Delta W_{TB})_{VF}$, total flutter design weight increment to be deleted.	TWT(4)
5	$\Delta\Sigma W_{rib}$, total intermediate rib or spar weight to be deleted.	TWT(5)

TABLE 236. TSS ARRAY, TOTAL WEIGHT SUMMARY DATA, SUBROUTINES TBØPT AND ATBØPT (CONT)

Array Location	Description	Source
6	$\Delta\Sigma W_{FS}$, total front spar weight to be deleted.	TWT(6)
7	$\Delta\Sigma W_{RS}$, total rear spar weight to be deleted.	TWT(7)
8	$\Delta\Sigma W_{misc}$, total miscellaneous structure and attachment weight to be deleted.	TWT(8)
9	$\Delta(W_{skin})_{upr}$, upper cover skin weight to be deleted.	TWT(9)
10	$\Delta(W_{str})_{upr}$, upper cover stringer or cap weight to be deleted.	TWT(10)
11	$\Delta(W_{misc\ skin})_{upr}$, upper cover miscellaneous skin weight to be deleted.	TWT(11)
12	$\Delta(W_{skin})_{lwr}$, lower cover skin weight to be deleted.	TWT(12)
13	$\Delta(W_{str})_{lwr}$, lower cover stringer or cap weight to be deleted.	TWT(13)
14	$\Delta(W_{misc\ skin})_{lwr}$, lower cover miscellaneous skin weight to be deleted.	TWT(14)
15	$\Delta(W_{cap})_{FS}$, front spar cap weight to be deleted.	TWT(15)
16	$\Delta(W_{web})_{FS}$, front spar web weight to be deleted.	TWT(16)
17	$\Delta(W_{cap})_{RS}$, rear spar cap weight to be deleted.	TWT(17)
18	$\Delta(W_{web})_{RS}$, rear spar web weight to be deleted.	TWT(18)
19	$\Delta(\Delta W_{skin})_{upr\ VF}$, upper cover skin flutter design increment to be deleted.	TWT(19)
20	$\Delta(\Delta W_{str})_{upr\ VF}$, upper cover stringer or cap flutter design increment to be deleted.	TWT(20)
21	$\Delta(\Delta W_{misc\ skin})_{upr\ VF}$, upper cover miscellaneous skin flutter design increment to be deleted.	TWT(21)
22	$\Delta(\Delta W_{skin})_{lwr\ VF}$, lower cover skin flutter design increment to be deleted.	TWT(22)
23	$\Delta(\Delta W_{str})_{lwr\ VF}$, lower cover stringer or cap flutter design increment to be deleted.	TWT(23)
24	$\Delta(\Delta W_{misc\ skin})_{lwr\ VF}$, lower cover miscellaneous skin flutter design increment to be deleted.	TWT(24)

TABLE 236. TSS ARRAY, TOTAL WEIGHT SUMMARY DATA, SUBROUTINES TBØPT AND ATBØPT (CONT)

Array Location	Description	Source
25	$\Delta(\Delta W_{rib})_{VF}$, intermediate rib or spar flutter design increment to be deleted.	TWT(25)
26	$\Delta(\Delta W_{web})_{FS\ VF}$, front spar web flutter design increment to be deleted.	TWT(26)
27	$\Delta(\Delta W_{web})_{RS\ VF}$, rear spar web flutter design increment to be deleted.	TWT(27)
28	$\Delta(\Delta W_{att})_{VF}$, miscellaneous structure and attachment flutter design increment to be deleted.	TWT(28)
29	0.0	TWT(29)
30	ΔW_{blhd}, bulkhead weight to be deleted.	TWT(30)
31	ΔW_{RR}, root rib weight to be deleted.	TWT(31)
32	$\Delta(W_{cap})_{RR}$, root rib cap weight to be deleted.	TWT(32)
33	$\Delta(W_{web})_{RR}$, root rib web weight to be deleted.	TWT(33)
34	$\Delta(W_{misc})_{RR}$, root rib miscellaneous and attachment weight to be deleted.	TWT(34)
35	ΔW_{RR}, root rib weight increment.	TWT(35)
36	$\Delta(W_{cap})_{RR}$, root rib cap weight increment.	TWT(36)
37	$\Delta(W_{web})_{RR}$, root rib web weight increment.	TWT(37)
38	$\Delta(W_{misc})_{RR}$, root rib miscellaneous and attachment weight increment.	TWT(38)
39	0.0	TWT(39)
40	0.0	TWT(40)
41	0.0	TWT(41)
42	0.0	TWT(42)
43	0.0	TWT(43)
44	0.0	TWT(44)
45	0.0	TWT(45)
46	0.0	TWT(46)
47	0.0	TWT(47)
48	0.0	TWT(48)
49	0.0	TWT(49)
50	0.0	TWT(50)
51	$\Delta\Sigma W_{C\text{-}SEC}$, total center section weight to be deleted.	TSS(1)

TABLE 236. TSS ARRAY, TOTAL WEIGHT SUMMARY DATA, SUBROUTINES TBØPT AND ATBØPT (CONT)

Array Location	Description	Source
52	$\Delta\Sigma W_{MISC}$, center-section secondary structure weight to be deleted.	TSS(2)
53	$\Delta(W_{cov})_{upr}$, center-section upper cover weight to be deleted.	TSS(3)
54	$\Delta(W_{cov})_{lwr}$, center-section lower cover weight to be deleted.	TSS(4)
55	ΔW_{rib}, center-section intermediate rib or spar weight to be deleted.	TSS(5)
56	ΔW_{FS}, center-section front spar weight to be deleted.	TSS(6)
57	ΔW_{RS}, center-section rear spar weight to be deleted.	TSS(7)
58	ΔW_{misc}, center-section miscellaneous structure and attachment weight to be deleted.	TSS(8)
59	$\Delta(W_{skin})_{upr}$, center-section upper cover skin weight to be deleted.	TSS(9)
60	$\Delta(W_{str})_{upr}$, center-section upper cover stringer or cap weight to be deleted.	TSS(10)
61	$\Delta(W_{misc\ skin})_{upr}$, center-section upper cover miscellaneous skin weight to be deleted.	TSS(11)
62	$\Delta(W_{skin})_{lwr}$, center-section lower cover skin weight to be deleted.	TSS(12)
63	$\Delta(W_{str})_{lwr}$, center-section lower cover stringer or cap weight to be deleted.	TSS(13)
64	$\Delta(W_{misc\ skin})_{lwr}$, center-section lower cover miscellaneous skin weight to be deleted.	TSS(14)
65	$\Delta(W_{cap})_{FS}$, center-section front spar cap weight to be deleted.	TSS(15)
66	$\Delta(W_{web})_{FS}$, center-section front spar web weight to be deleted.	TSS(16)
67	$\Delta(W_{cap})_{RS}$, center-section rear spar cap weight to be deleted.	TSS(17)
68	$\Delta(W_{web})_{RS}$, center-section rear spar web weight to be deleted.	TSS(18)

TABLE 236. TSS ARRAY, TOTAL WEIGHT SUMMARY DATA, SUBROUTINES TBØPT AND ATBØPT (CONT)

Array Location	Description	Source
69	$\Delta(W_{rib})_{C/L}$, center-section centerline rib weight to be deleted.	TSS(19)
70	ΔW_{blhd}, center-section bulkhead weight to be deleted.	TSS(
71	0.0	TSS
72	0.0	TSS(22
73	0.0	TSS(2
74	0.0	TSS(24
75	0.0	TSS(25)
76	0.0	TSS(26)
77	0.0	TSS(27)
78	0.0	TSS(28)
79	0.0	TSS(29)
80	0.0	TSS(30)
81	$D'_{ØBD\ lug}$, couple-arm for outboard lugs, in.	TSS(31)
82	$(M_{X\Lambda})_{pivot}$, ultimate bending moment at structural reference line station of the pivot centerline, in-lb.	TSS(32)
83	D_{pivot}, mold line depth at pivot centerline, in.	TSS(33)
84	$P_{ØBD\ lug}$, axial load on outboard pivot lugs, lb.	TSS(34)
85	f_{br}, allowable bearing stress for pivot bearings, psi.	TSS(35)
86	$ØD_{pin}$, outer-diameter of pivot pin, in.	TSS(36)
87	ID_{pin}, inner-diameter of pivot pin, in.	TSS(37)
88	0.0	TSS(38)
89	0.0	TSS(39)
90	0.0	TSS(40)
91	ΣW_{pivot}, total pivot structure weight.	TSS(41)
92	$(W_{lug})_{IBD}$, inboard lug weight.	TSS(42)
93	$(W_{lug})_{ØBD}$, outboard lug weight.	TSS(43)
94	W_{pin}, pivot pin weight.	TSS(44)
95	$(W_{rib})_{IBD}$, inboard lug-rib weight.	TSS(45)
96	$(W_{misc})_{pivot}$, miscellaneous structure weight for pivot.	TSS(46)

TABLE 236. TSS ARRAY, TOTAL WEIGHT SUMMARY DATA, SUBROUTINES TFØPT AND ATBØPT (CONCL)

Array Location	Description	Source
97	$(\text{Width})_{IBD}$, structural chord of fixed structure at the inboard lug-rib station, in.	TSS(47)
98	$(\text{Width})_{ØBD}$, structural chord of fixed structure at the outboard lug-rib station, in.	TSS(48)
99	$(Y_{\text{lug-rib}})_{IBD}$, Y-coordinate of inboard lug-rib, in.	TSS(49)
100	$(Y_{\text{lug-rib}})_{ØBD}$, Y-coordinate of outboard lug-rib, in.	TSS(50)

TABLE 237. TØ ARRAY, SUBROUTINES TBØPT AND CNSTR

General information for array TØ:

Blank common reference location = T(920)

Array size = 40 cells

Array TØ contains metallic torque-box optimization data created and used by subroutines TBØPT, overlay (9,0) and CNSTR, overlay (10,0), during the optional single-value torque-box NØS or b optimization procedure, specified by analysis control code DØPT, D(1365). For multirib or multispar designs, an input value of 2 directs TBØPT to optimize total torque-box weight for constant number of stringer or spar elements, NØS, at all 11 stations; an input value of 3 causes TBØPT to optimize total torque-box weight for constant spacings, b, at each station. These codes direct TBØPT to perform the optimization when analysis pass counter NØDW, ND(56), equals 3. TØ array data are then created for optimum NØS or b selection between specified minimum and maximum values, using subroutine CNSTR and assuming constant design loads based on the loads computed for pass 3. The selected optimum value is kept constant for the two subsequent passes, NØDW - 2 and 1, but the design loads are adjusted for changes in torque-box weight distribution and couple-arms. TØ array data are not created when DØPT is specified as 0.0 or 1.0.

Array Location	Description
Locations 1 through 3 contain calculated torque-box weights for the current analysis point. Subroutine CNSTR sets up these weights from results of subroutine WTCAL computations after all 11 stations have been analyzed. Station J weight is derived from the total surface weight summary data set saved by CNSTR in TW(801) - TW(900) after completion of analysis at Station J. Station J is the analysis station specified in D(1366), input data variable DØPTJ, used to segment to torque-box into two panels for which calculated weights are saved in locations 2 and 3. The weight summary for the panel outboard of station J is printed by subroutine PKTA as part of the design summary output. Currently, these inboard/outboard panel data are used for information purposes only, but logic changes can be made to optimize these panels separately for NØS or b, or to change the type of search. The input data set default value for DØPTJ is station 6. However, if this variable is specified as 0.0, subroutine TBØPT will assume station 5 as the internal default value.	

TABLE 237. TØ ARRAY, SUBROUTINES TBØPT AND CNSTR (CONT)

Array Location	Description
1	$(\Sigma W_{TB})_i$, total torque-box weight of current analysis point, lb/side. The optimization type is identified by the value of code word IØP1, ND(82); 2 = number of stringer or spars, 3 = stringer or spar spacing. Location 6 contains the current value for the search variable.
2	$(\Sigma W_{TB})_{sta(1-J)i}$, torque-box weight of inboard panel between root station and station J, lb/side.
3	$(\Sigma W_{TB})_{sta(J-11)i}$, torque-box weight of outboard panel between station J and tip station, lb/side.
4	$\Delta Y_{\Lambda IB}$, structural span of inboard panel, distance between root station and station J along structural reference line, in.
5	$\Delta Y_{\Lambda ØB}$, structural span of outboard panel, distance between station J and tip station along structural reference line, in.
Locations 6 through 17 contain search variable and limits data computed and used by TBØPT. Values are dependent upon torque-box optimization type. Search limits and intervals are determined from values specified in D(1367) - D(1370), input data array DØP2, for NØS search and D(1371) - D(1374), input data array DØP3 for b search.	
6	$NØS_i$ or b_i, search parameter value of current point, computed by TBØPT and used by CNSTR at each analysis station.
7	Not used.
8	$NØS_{max}$ or b_{max}, maximum value for search parameter, set up by TBØPT from DØP2(1) or DØP3(1), value used as the first analysis point in torque-box optimization.
9	$NØS_{min}$ or b_{min}, minimum value for search parameter, set up by TBØPT from DØP2(2) or DØP3(2).
10	$\Delta NØS_1$ or Δb_1, search parameter increment for initial optimum point search, set up by TBØPT from DØP2(3) or DØP3(3).
11	$\Delta NØS_2$ or Δb_2, search parameter increment for evaluation of intermediate points after optimum search parameter region has been found, set up by TBØPT from DØP2(4) or DØP3(4).
12-17	Not used

TABLE 237. TØ ARRAY, SUBROUTINES TBØPT AND CNSTR (CONCL)

Array Location	Description
Locations 18 through 24 contain data for search point i-1 and i-2, saved and used by TBØPT.	
18	$(\Sigma W_{TB})_{i-1}$, total torque-box weight of point $N\emptyset S_{i-1}$ or b_{i-1}, computed during initial search using $N\emptyset S_1$ or b_1, lb/side.
19	$(\Sigma W_{TB})_{sta(1-J)\,i-1}$, torque-box weight of inboard panel for point $N\emptyset S_{i-1}$ or b_{i-1}, lb/side.
20	$(\Sigma W_{TB})_{sta(J-11)\,i-1}$, torque-box weight of outboard panel for point $N\emptyset S_{i-1}$ or b_{i-1}, lb/side.
21	$N\emptyset S_{i-1}$ or b_{i-1}, search parameter value of point i-1.
22	N_i, search point counter, number of primary and intermediate points analyzed.
23	$(\Sigma W_{TB})_{i-2}$, total torque-box weight of point $N\emptyset S_{i-2}$ or b_{i-2}, lb/side.
24	$N\emptyset S_{i-2}$ or b_{i-2}, search parameter value for point i-2.
25-40	Not used.

REFERENCES

1. Bruhn, E. F., Analysis and Design of Flight Vehicle Structures, Tri State Offset-Company, Ohio, 1965

2. Gerard, G., Minimum Weight Analysis of Compression Structures, University Press, New York, 1956

3. Peery, David J., Aircraft Structures, McGraw-Hill, New York, 1950

4. Roark, Raymond J., Formulas for Stress and Strain, McGraw-Hill New York, 1954

5. Shanley, F. R., Weight-Strength Analysis of Aircraft Structures, McGraw-Hill, New York, 1952

6. Timoshenko, S., Theory of Elastic Stability, McGraw-Hill, New York, 1936

7. Military Standardization Handbook MIL-HDBK-5B, Metallic Materials and Elements for Aerospace Vehicle Structures, Department of Defense, Washington, D.C., 1971

8. Military Handbook MIL-HDBK-23A, Structural Sandwich Composites, Department of Defense, Washington, D.C., 1968

9. Advanced Composites Design Guide, Rockwell International/Los Angeles Aircraft Division Draft Report for Contract F33615-71-C-1362, Air Force Materials Laboratory, Wright-Patterson Air Force Base, Ohio, 1973

10. Honeycomb Sandwich Structures Manual, NA-58-889, Rockwell International, Los Angeles, Calif., 1958

11. Structures Manual, NA-52-400, Rockwell International, Los Angeles, Calif., 1952

12. Crawford, R. F., and Burns, A. B., "Minimum Weight Potentials and Design Information for Stiffened Plates and Shells," American Rocket Society Launch Vehicles Structures and Materials Conference, April 1962

13. Emero, D. H., and Spunt, L., "Minimum Weight Analysis of Multirib and Multiweb Wing Box Structures," NA-64-923, Rockwell International, Los Angeles, Calif., 1964

14. Gerard, G., "Minimum Weight Analysis of Orthotropic Plates Under Compressive Loading," Journal of Aerospace Sciences, January 1960

15. Konishi, D. Y., and Lackman, L. M., "Minimum Weight Analysis of Shear Loaded Structures," NA-67-669, Rockwell International, Los Angeles, Calif., 1967

16. Land, Norman S., and Fox, Annie G., "An Experimental Investigation of the Effect of Mach Number, Stabilizer Dihedral, and Fin Torsional Stiffness on the Transonic Flutter Characteristics of a Tee-Tail," TND-923, National Aeronautics and Space Administration, Virginia, 1957

17. Posluszny, D. A., and Carpenter, J., "Derivation of A Spanwise Torsional Constant J, for a Multi-Station Weight Increment," NA-61-1039, Rockwell International, Los Angeles, Calif., 1961

18. Schilling, J. F., "Approximate Flutter Stiffness Requirements for Preliminary Design Parametric Studies," NA-66-959, Rockwell International, Los Angeles, Calif., 1966

19. Spunt, L., "Preliminary Optimization and Evaluation of Multiweb and Multispar Wings," NA-64-645, Rockwell International, Los Angeles, Calif., 1964